TECHNOLOGY DEPARTMENT

ROADS AND STREETS

BRIDGES
AIRFIELDS
CONSTRUCTION

APRIL 1949

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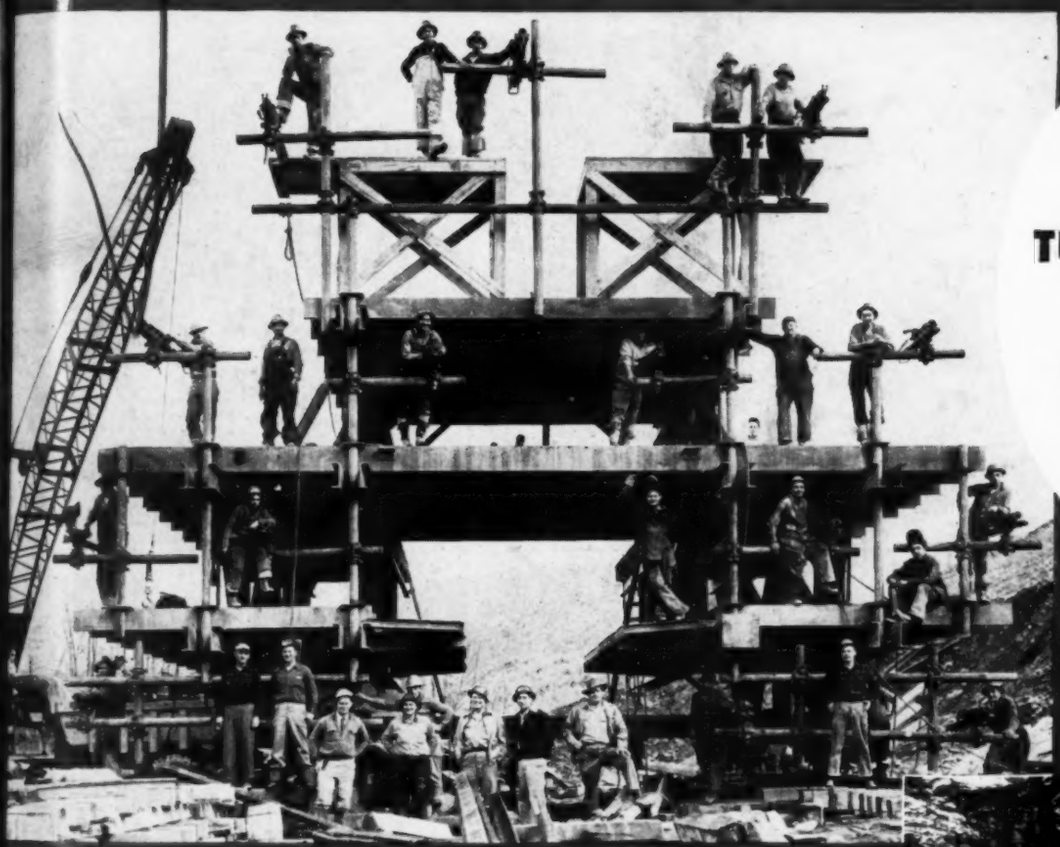
DETROIT

ANOTHER BIG WATER TUNNEL DRILLED WITH TIMKEN® ROCK BITS



Photographs courtesy Gardner-Denver Company, Quincy, Ill.

Walsh-Perini Construction Company, Downsville, New York, recently completed the drilling of one of the largest rock tunnels ever constructed — the largest since the construction of the Hoover dam.

This big water diversion tunnel is 2,200 feet long. It is part of a $13,700,510 project to bring water from the East branch of the Delaware river to New York City. 165,000 cubic yards of rock were excavated in the construction of the tunnel.

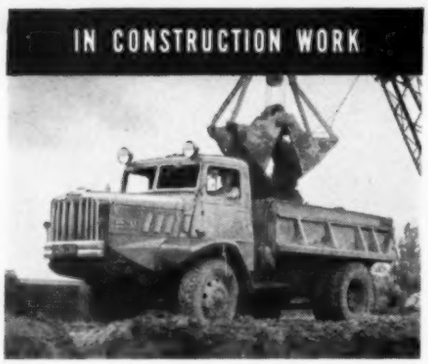
Top heading was drilled with Timken Rock Bits in Gardner-Denver CF99N Automatic Feed Drifters. The drifters, 20 in number, were mounted on the world's largest jumbo. The 17 ft. bench was drilled with Timken Bits in 8 Gardner-Denver D99D Wagon Drills. In finishing the job within the time set, the contractor has expressed complete satisfaction with the performance and economy of Timken Bits.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO - CABLE ADDRESS "TIMROSCO"

WALTER SNOW FIGHTERS

earn their keep the year 'round!



NOW that winter is over, Walter Snow Fighters begin paying a bonus in continued all-around usefulness to highway departments. Take off the plows and put the big, powerful, 100% traction Walter truck to work on any job requiring a heavy-duty truck . . . and many jobs no other trucks can do.

Often, instead of the usual dump body, many communities equip their Walter Snow Fighters with auto-eductor bodies, crane and wrecking equipment, street sprinklers and other special equipment to get year-round service. With the non-slipping traction of Walter 4-Point Positive Drive, these units operate in all weather and running conditions, on or off the highway.

WALTER
4-POINT POSITIVE DRIVE
SNOW FIGHTERS

● If your past winter's experience shows the need for more powerful and dependable snow removal equipment, investigate the many combinations and advantages available with Walter Snow Fighters. See your Walter distributor—or, write us for literature and details.

WALTER MOTOR TRUCK CO. 1001-19 Irving Ave. Ridgewood 27, Queens, L. I., N. Y.

Extending New York's West Side Elevated Highway

Completed roadway, looking south. Local waterfront traffic and docks visible at right.

Huge 44-ton girder, fabricated by Bethlehem, is slowly wheeled into place. Bethlehem fabricated and erected 2552 tons of structural steel for the West Side Highway extension.

Henry Levinson (center), Section Engineer, Office of President, Borough of Manhattan, with Eric Nelson (left), General Superintendent, and A. J. Linsky, President, Lynn Construction Co.

Street-level view, showing steelwork completed. Local traffic was maintained while overhead construction was in progress.

Tying Bethlehem Reinforcing Bars, prior to pouring concrete. Bethlehem Reinforcing Bars used in this project totaled 350 tons.

In order to provide a direct, high-speed approach to the new Brooklyn-Battery Tunnel, the Borough of Manhattan of the City of New York recently extended the lower end of its heavily-traveled West Side Elevated Highway. These scenes were taken on a 1217-ft stretch of the new four-lane road, between Duane and Barclay Sts. Contractor: Lynn Construction Co., Inc., New York. Structural steel fabricated and erected, and reinforcing bars supplied by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
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BETHLEHEM STEEL

ROADS AND STREETS

April, 1949 • Vol. 92 • No. 4

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

In This Issue

Coming Articles

"Roadbuilders at Work" Beginning New Series

After some shuffling of dates, here's the line-up for the next three months, for a new kind of editorial effort—a special 10-15 page section each month devoted to a timely topic.

May: Lessons and Experiences of the West's Worst Winter.

June: Power Maintenance Methods.

July: Getting the Most out of Your Truck and Trailer Investment. Experiences and data from R & S readers welcome on any of these subjects. Send us snapshots!

Other Articles Soon

Fast Jobs of '48. Half a dozen more contractor job summaries coming along—paving, grading.

Aggregate Production. Several stories soon.

Rock Work. How a blast was controlled to protect adjacent railroad tracks (N. Mex.) . . . TNT used on this job (Indiana).

Road Design. How two stone sizes were blended for economical base design utilizing available materials. . . . How Kansas design formula was devised.

Bridges. Construction methods and problems articles from Louisiana, Florida, Connecticut, other states. . . . Also pictorial round-up of bridge examples from many states.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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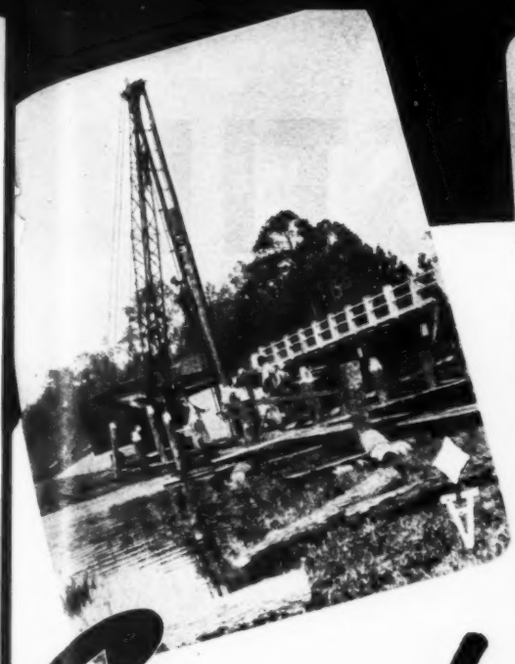


Grand Slam

in bridge building

with TL-20 CRANEPOWER

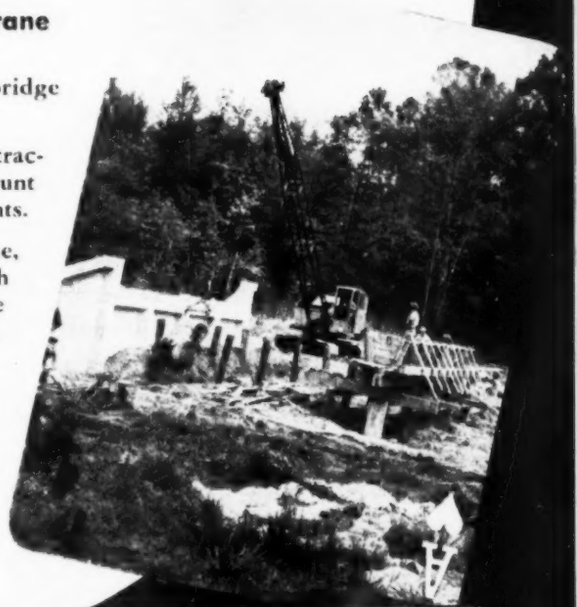
Goodwyn & Murphree, Troy, Alabama, own 4 Lorains . . .
"trump" construction costs on bridge job with 1 Lorain TL-20 Crane

Here's how Goodwyn & Murphree made a "Grand Slam contract" on a bridge building job near Red Bay, Alabama.

Leading with a TL-20, one of four company-owned Lorains, the contractors "finessed" every operation and "trumped" construction costs on every count with this power-packed, versatile machine and its various crane attachments.

Tricks taken by the TL-20 as shown by the photos—top left: TL-20 crane, equipped with 1250 lb. drop hammer, drives 75 ten-inch piles to 10 ft. depth in 10 hr. day for two cofferdams below water level. Top right: Swinging the concrete mixer into place. Center: Pouring concrete into forms. Bottom right: Working as a dragline to dig foundation for a concrete form.

This is one of hundreds of construction jobs where the TL-20 is taking extra tricks in production with its labor-saving selection of boom equipment and choice of either crawler or rubber-tire mountings. For this peppy, multi-purpose machine provides over 50 possible combinations to fit your job conditions . . . a full "deck of aces" for a profitable operation. Let your Thew-Lorain Distributor deal you all the facts on this money-making machine—today!



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LORAIN, OHIO

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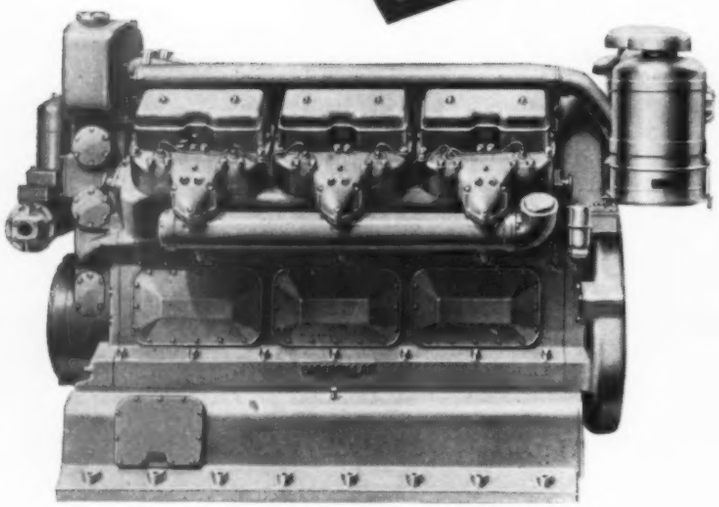
Thew Lorain TL-20

...STILL

WHEN YOU THINK OF INDUSTRIAL AND CONSTRUCTION POWER, THINK OF THE BIG YELLOW ENGINES THAT SUPPLY SO MUCH OF IT



"CATERPILLAR" DIESEL D397 ENGINE—500 hp. (max.) at 1200 rpm. V-12—5¾" bore x 8" stroke. Equipped with blower.

"CATERPILLAR" DIESEL D386 ENGINE—400 hp. (max.) at 1200 rpm. V-12—5¾" bore x 8" stroke.

Now you can power your larger machines with available new-size engines that extend the range of "Caterpillar" Diesels to 500 horsepower. These bigger "yellow engines" are designed, built and job-tested with the same exhaustive thought and care that have enabled thousands of their older family members to run up records of forty, fifty and even seventy thousand hours of dependable operation. They have the same ruggedness, the same efficient fuel system and fuel economy, the same high all-round quality that have made "Caterpillar" Diesels world famous for low lifetime cost-per-hour.

When you need a bigger or more powerful shovel, dredge, ditcher, crusher, asphalt plant, or other piece of heavy power equipment, specify these bigger yellow "Caterpillar" Diesels. Let your "Caterpillar" dealer give you full information on these new engines. He is as near as your telephone.

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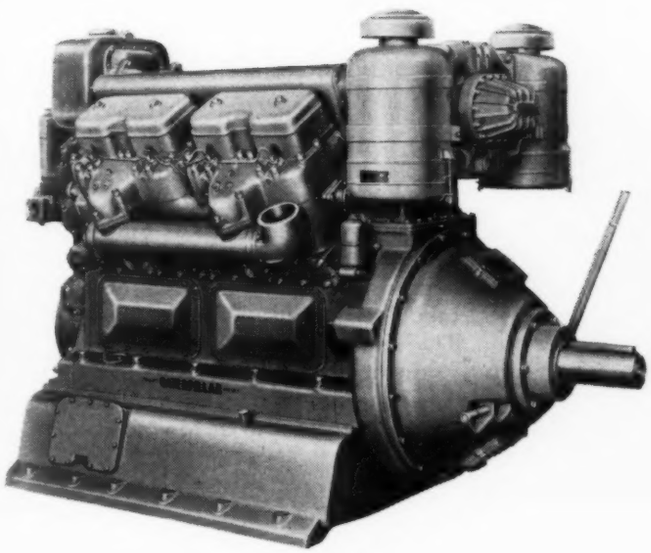
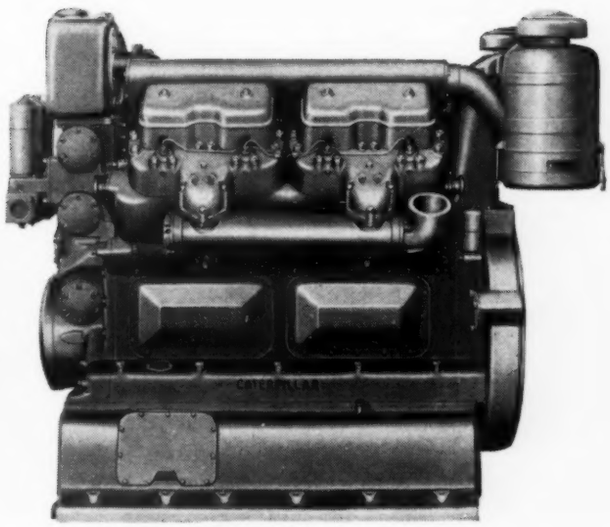
BIGGER YELLOW ENGINES ...FOR YOUR LARGER JOBS



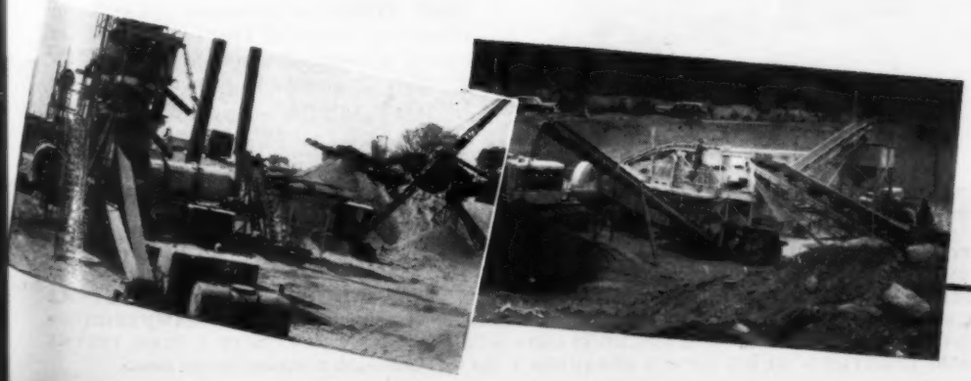
"CATERPILLAR" DIESEL D375 ENGINE—335 hp. (max.) at 1200 rpm. V-8—5¾" bore x 8" stroke. Equipped with blower.



"CATERPILLAR" DIESEL D364 ENGINE—265 hp. (max.) at 1200 rpm. V-8—5¾" bore x 8" stroke.

CATERPILLAR DIESEL

REG. U. S. PAT. OFF.



ENGINES
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Cedarapids

Built by IOWA

LOW INITIAL COST
plus
LOW MAINTENANCE COSTS

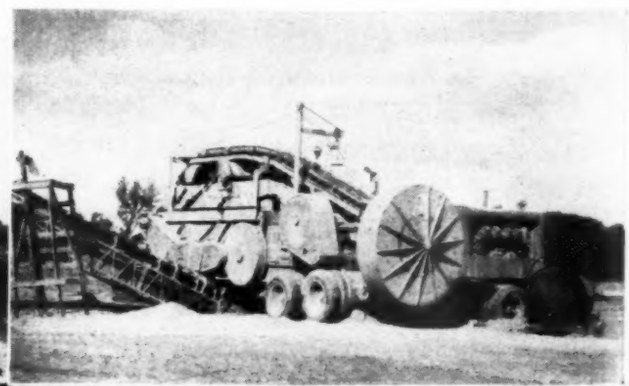
CRUSHING AND SCREENING PLANTS

900 CUBIC YARDS of 1" material and 725 cubic yards of ¾" produced in 9 hours by this Cedarapids Portable Unitized Crushing and Screening Plant in Wisconsin. The plant consists of a jaw crusher primary and a roll crusher secondary.

LOW first cost, low operating cost, minimum repairs and maintenance — that's where your annual savings *begin* with Cedarapids Crushing and Screening Plants! And savings *continue,* year after year! With Cedarapids plants on the job, you get a combination of high capacity flexibility, portability and low operating costs that keep you consistently in the money. Smooth, balanced coordination of screens, crushers and conveyors ... instant adaptation to a wide variety of jobs ... fast, easy set-up and take-down ... all add up to more profitable operation. There's a wide range of sizes and types for every production need. From the smallest unit to the largest plant, Cedarapids Crushing and Screening equipment is built for high output at low cost.

35 CUBIC YARDS an hour with 55% of material crushed. That's easy production for this Cedarapids Pitmaster, the smallest complete tandem portable crushing and screening plant in the Iowa line. Operating in Canada.

100 CUBIC YARDS per hour of ¾" aggregate from this Cedarapids Junior Tandem. This plant is operating between the Elk River and Big Lake in Minnesota, producing aggregate for gravel surfacing shoulder and for black topping intersections.



260 TONS per hour with 35% crushing of minus 1" material! That's the production record of this Cedarapids Master Tandem Portable Crushing and Screening Plant in Colorado. *(above)*

Cedarapids

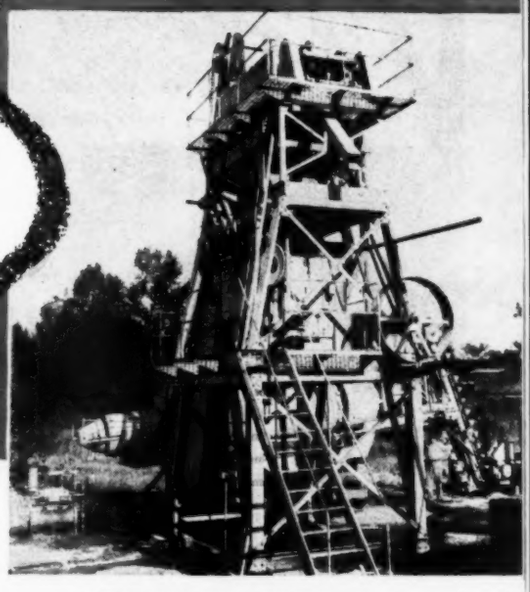
Built by IOWA

The IOWA LINE *of Material Handling Equipment Includes:*

ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS — STEEL BINS • BUCKET ELEVATORS • VIBRATOR AND REVOLVING SCREENS • STRAIGHT LINE ROCK AND GRAVEL PLANTS • FEEDERS—TRAPS • PORTABLE POWER CONVEYORS • PORTABLE STONE PLANTS • PORTABLE GRAVEL PLANTS • REDUCTION CRUSHERS • BATCH TYPE ASPHALT PLANTS • HAMMERMILLS • DRAG SCRAPER TANKS • WASHING PLANTS • SOIL COMPACTION UNITS • STEEL TRUCKS AND TRAILERS • KUBIT IMPACT BREAKERS • *See Your Cedarapids Distributor For Full Details*

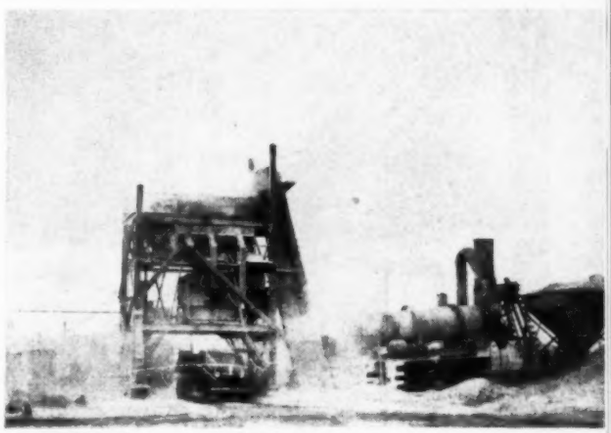
assure LOW COST PER YEAR

BITUMINOUS MIXING PLANTS

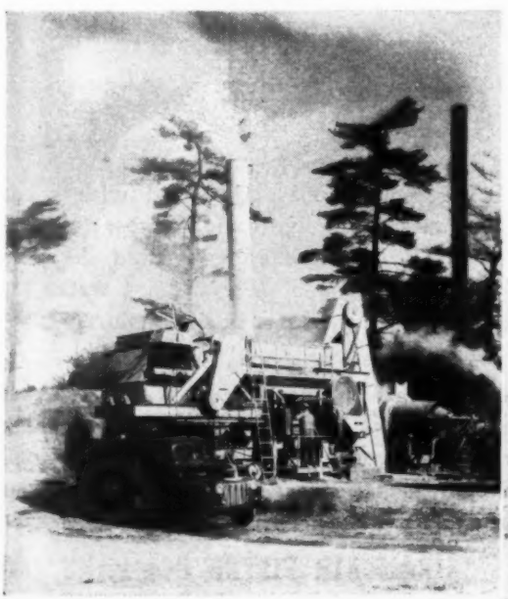


200 TO 250 TONS per day produced by this Cedarapids 1000 lb. Model "A" Bituminous Mixing Plant in Alabama. Another production record for Cedarapids.

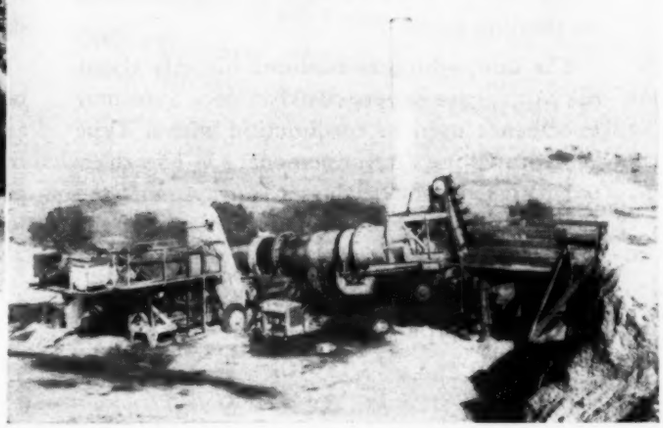
WHATEVER your bituminous paving projects, you'll get bigger annual savings when you put Cedarapids Bituminous Mixing Plants on the job. Every feature is engineered for high tonnages accurately mixed at lowest possible cost. Perfectly matched screens, batchers, pug mills, elevators and driers assure a smooth, steady flow of uniform mixes that consistently meet the most exacting specifications. Finger-tip operating control assures fast, easy operation. Low over-all travelling dimensions and weight simplify transportation problems. Rock-bottom initial cost, plus low operating and maintenance costs, keep you in the profit picture. Cedarapids Portable, Stationary, Batch-Type and Continuous-Mix Plants are available in sizes and types for every requirement. When you buy a Bituminous Mixing Plant, buy the best — buy Cedarapids.



100,000 TONS of thoroughly mixed bituminous material produced by this 3000 lb. Cedarapids Model "E" Batch-Type Bituminous Mixing Plant and another 2000 lb. Model "E" Batch-Type Plant for resurfacing airport runways. *(right)*



As much as **350 TONS** per day of bituminous materials, thoroughly mixed, were produced by this Cedarapids Super-Portable Model "FA" in Ohio. *(above)*

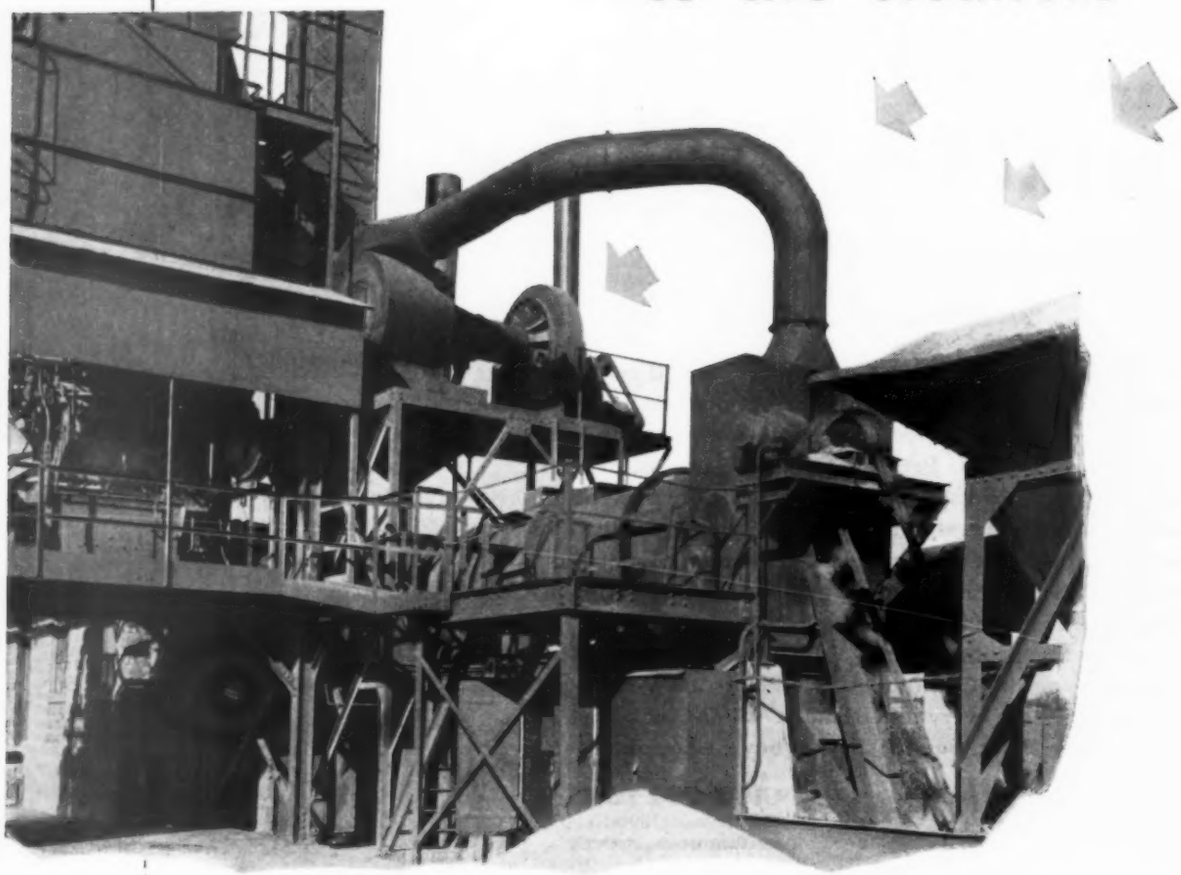


20 TO 30 TONS per hour production is obtained from this Cedarapids Portable Patchmaster, a volumetric type bituminous mixing plant in Iowa.

IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U.S.A.

ROTO-CLONE takes another asphalt plant to the cleaners



A BUSY season is coming up for this big asphalt plant. And the aggregate dryer will be the source of plenty of dust—but no complaints. That's because a Roto-Clone* is on the job.

The unit, which is mounted directly above the aggregate dryer, consists of a Skimmer Precleaner used in conjunction with a Type W Roto-Clone (Arrangement A). The dust-laden air from the dryer is first drawn into the Precleaner where a high percentage of the material is collected dry for salvage.

From the Precleaner, the air passes into the Type W Roto-Clone where dynamic precipitation is combined with water sprays to trap the finest and lightest dust particles. The air is then exhausted dust-free while the collected material and water are discharged in the form of a thin slurry.

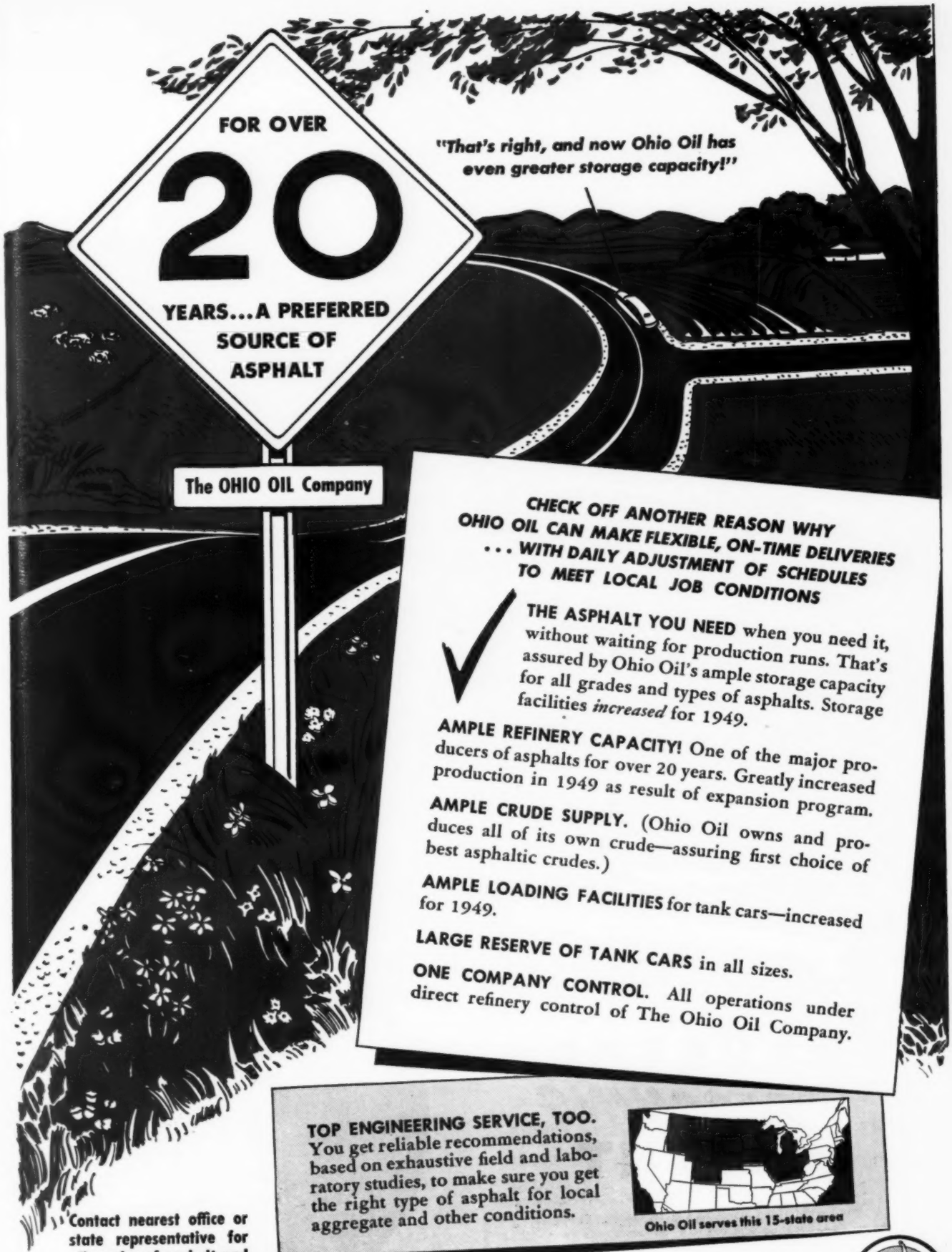
Why not make dust-control your business before the community makes it theirs? Scores of asphalt plants have solved this problem with the proper application of Roto-Clones. Complete information can be obtained from your local AAF representative or by writing direct to:

AMERICAN AIR FILTER COMPANY, INC.
306 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*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20
YEARS...A PREFERRED SOURCE OF ASPHALT
"That's right, and now Ohio Oil has even greater storage capacity!"
The OHIO OIL Company

CHECK OFF ANOTHER REASON WHY OHIO OIL CAN MAKE FLEXIBLE, ON-TIME DELIVERIES ... WITH DAILY ADJUSTMENT OF SCHEDULES TO MEET LOCAL JOB CONDITIONS

✓ **THE ASPHALT YOU NEED** when you need it, without waiting for production runs. That's assured by Ohio Oil's ample storage capacity for all grades and types of asphalts. Storage facilities *increased* for 1949.

AMPLE REFINERY CAPACITY! One of the major producers of asphalts for over 20 years. Greatly increased production in 1949 as result of expansion program.

AMPLE CRUDE SUPPLY. (Ohio Oil owns and produces all of its own crude—assuring first choice of best asphaltic crudes.)

AMPLE LOADING FACILITIES for tank cars—increased for 1949.

LARGE RESERVE OF TANK CARS in all sizes.

ONE COMPANY CONTROL. All operations under direct refinery control of The Ohio Oil Company.

TOP ENGINEERING SERVICE, TOO. You get reliable recommendations, based on exhaustive field and laboratory studies, to make sure you get the right type of asphalt for local aggregate and other conditions.

Ohio Oil serves this 15-state area

Contact nearest office or state representative for all grades of asphalt and asphalt cements.

The OHIO OIL Company • *Asphalt Department*

ROBINSON, ILLINOIS • LOVELL, WYOMING • *Producers of Petroleum since 1887*

MARATHON

INSTALL THIS

KEEP your highway safety record clean. Equip all your vehicles with Keystone Flashing Lights. Give your men—the tax-payer—and your equipment—the protection only this Keystone Flashing Light affords. Flashes two ways at once—*both to front and rear*. It does the work of two lights at the cost of one.

Used from Texas to Maine on highway equipment and by hundreds of cities, counties, towns, park and bridge commissions, public utilities, etc., on ALL types of vehicles. Before you turn this page, write for sample light—no obligation.

Auto Gear & Parts Co., Inc.
16th St. & Hunting Park Ave., Philadelphia 40, Penna.

KEYSTONE *FLASHING* LIGHT

Specially designed heavy-duty light for highway use—vibration proof—water and dust tight. Can be mounted anywhere on the vehicle. Supplied with 6½ inch red lenses lettered "STOP" or with plain red, amber or blue lenses, for 6 and 12 volt systems.

Smooth going on a rocky road

It takes a shovel with rugged dependability to make profitable headway on a rock cut like this. That's why the machine on the job is a Bucyrus-Erie 54-B, for the 2½-yd. 54-B combines big-shovel strength, power and durability with small-shovel speed and efficiency. The result is more passes per shift, more cubic yards of dirt or rock moved every hour, more profits on your excavating contracts.

You can't go wrong by following the choice of the nation's top contractors, for their experience has proved the dependability, efficiency and economy of Bucyrus-Eries. See them in action for yourself, then see your Bucyrus-Erie distributor for more information on the ⅜- to 2½-yd. line.

BUCYRUS ERIE

The BEST buy Bucyrus, the best BUY in excavators

148E48

Bucyrus-Erie Company
South Milwaukee, Wisconsin

"C" TOURNAPULL averages 2

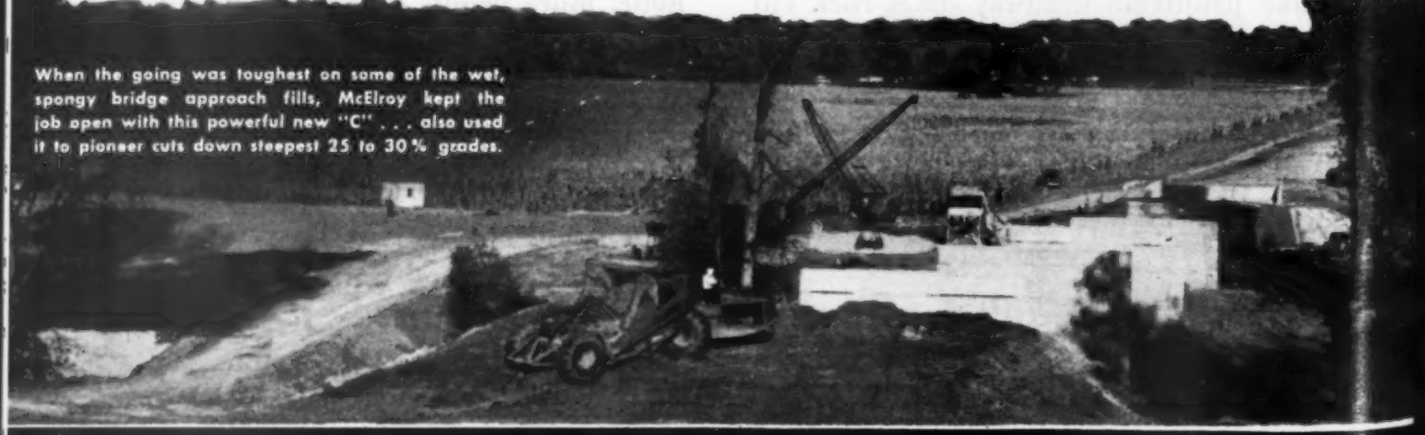
C Tournapull consistently loaded 10 pay yards of loamy clay in an average of 36 seconds. Loading distance varied from 60 to 90 feet.

R. V. McElroy CONSTRUCTION CO.

had a good opportunity to compare performance of their electric-control C Tournapull with several other types of rubber-tired dirtmovers. The job, relocating U. S. 40 near Greenup, Ill., was a tough one . . . included 663,000 cu. yds., mostly hard-packed clay . . . grades as steep as 25 to 30% in some places . . . and wet, spongy bridge approach fills. McElroy's equipment fleet included 4 veteran LeTourneau Super C Tournapulls, several other "Tournapull-type" machines and rubber-tired wagons. Their new 150 h.p. "C" out-paced every machine on the job with bigger pay yard output . . more grade and mud-ability. Here's a typical comparison on one 600' haul:

Made 20 trips to next rig's 14

Pusher loaded on sidehill cut . . . with 200' of the 600' haul down grade . . . spreading on bridge approach fill . . . and returning up the steep 21% grade to cut, McElroy's new C Tournapull made a round trip every 2.6 minutes, averaged 20 loads (200 pay yards) per hour! Another self-propelled, rubber-tired scraper unit (8 yd. capacity) working with same pusher, out of same cut, over same haul, took 3.5 minutes per round trip . . . averaged only 14.2 trips per hour. In other words, the electric-control C Tournapull made trips in ⅓rd less time, delivered more yards per trip than the smaller



When the going was toughest on some of the wet, spongy bridge approach fills, McElroy kept the job open with this powerful new "C" . . . also used it to pioneer cuts down steepest 25 to 30% grades.

LE TOURNEAU LET EQUIPMENT

See your Le Tourneau Distributor NOW for complete information

200 PAY YARDS AN HOUR
on 600' 1-way haul...21% grades

Positive power steer and powerful air brakes enabled the C Tournapull to safely high-ball down 21% grade in 4th gear. On return to cut, the "C" climbed up the steep 200' grade in 2nd gear.

unit. McElroy's own load-counter on the "C" showed 120 trips over a 5½-hour period.

Even tops Super C performance

McElroy's new "C" put his Super C Tournapulls "in the shade", too! On a 3,000' haul, the electric-control "C" made 7 trips to the Super C's 4. That's because the new, faster "C", with its power-proportioning differential, could take 17 to 21% grades in higher gear . . . and go through spongy fill in 4th gear, where the Super C had to drop back to 3rd.

"Gave it all the tough going"

"Cap" Kennedy, grade foreman, said: "I've been in this business 46 years, and this new 'C' is the best piece of equipment I ever saw. I gave it all the tough going . . . works any place." Stanley Jones, operator, backs this up with . . . "I've started all the bad cuts with it because it gets up and down 25 to 30% grades where other equipment couldn't even climb up. I can go down the 21% grade in 4th gear because its brakes stop it any place on the grade. There's no jack-knifing with this positive steer, either. Electric controls are swell . . . no comparison in operation, it's so much easier. It turns short on fills, you don't have to back up . . . and sure has plenty of traction. I can take a load through mud where the others can't go empty."

Better see for yourself what this high-production, electric-control C Tournapull can do on your jobs. Get all the facts from your LeTourneau Distributor *TODAY.*

Tournapull-Trademark Reg. U. S. Pat. Off. R145

Hauling over distances from less than 600 feet up to 4,000 feet, McElroy's fleet of 5 Tournapulls moved over 70% of total 663,000 cu. yds., on relocation of U. S. 40 near Greenup, Ill.

LETOURNEAU PEORIA, ILLINOIS — HIGH-SPEED RUBBER-TIRED — **TOURNAPULLS**

MORE YARDS PER HOUR WITH RUBBER-TIRED POWER

More Than 250,000 HOMELITE UNITS

Pumps · Generators · Chain Saws · Blowers · Paving Breakers

Are on the Job

Everywhere

HOMELITE PUMPS

Everywhere . . . even in the most remote places . . . wherever water has to be pumped out fast *and with the least trouble* you'll find Homelite Carryable Gasoline-Engine-Driven Pumps in action.

HOMELITE GENERATORS

For operating electric tools . . . both high-cycle and standard 110 volt . . . and for operating floodlights, Homelite Carryable Gasoline-Engine-Driven Generators are the ever-ready, ever-dependable favorites everywhere.

HOMELITE CHAIN SAWS

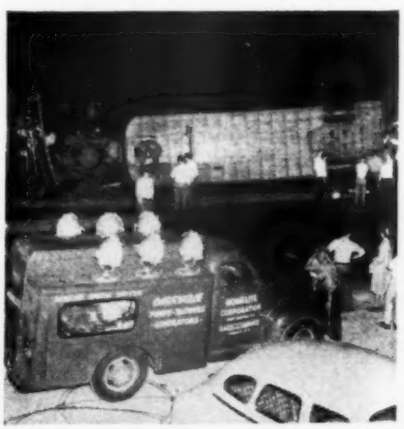
Lightweight, compact, safe and easy to handle, these one-man, high-cycle electric chain saws have super-fast cutting power and are rugged and dependable for all types of cutting on both tree work and construction jobs.

HOMELITE PAVING BREAKERS

More and more the new 84-lb. Homelite *Electric* Paving Breaker is being enthusiastically received by those who want a fast, efficient breaker that is compact and easy to move.

HOMELITE BLOWERS

Where ejecting smoke or supplying fresh air is a must for safety and efficiency, Homelite Carryable Gasoline-Engine-Driven Blowers are constantly on the job.



HOMELITE SERVICE

In all parts of the country Homelite representatives are ready to demonstrate the advantages of Homelite units and to service most efficiently all Homelite equipment.

Homelite Corporation

904 RIVERDALE AVENUE, PORT CHESTER, NEW YORK

Manufacturers of
Homelite Carryable Pumps • Generators • Blowers • Chain Saws • Paving Breakers

See how Homelite Equipment can save time, trouble and money for you. Send for descriptive bulletins on any or all of the equipment shown above.

Galion Performance Pays Off!

ENGINEERED TO EXCEL

GALION 3-Wheel, Tandem, and Portable Rollers have the built-in stamina and advanced features that result in top performance.

Write for complete information on the type of roller in which you are interested.

GALION
ESTABLISHED 1907

GRADERS · ROLLERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address GALIONIRON, Galion, Ohio

MULTI FOOTE and B

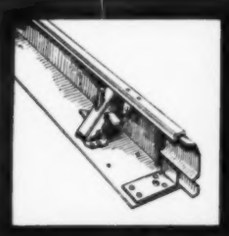
Everything you need for HIGH SPEED LOW COST PAVING

BLAW-KNOX Precision Subgrader

The only machine that will produce a perfect grade, true to crown and cross-section through the hardest material. The Blaw-Knox Precision Subgrader is the answer to all these problems:— Accurate control of slab thickness; smooth, uniform grade; reduced overrun of concrete; a minimum of handwork and adjustment; high capacity to keep ahead of pavers; lower cost of the most expensive type of excavation.

BLAW-KNOX Finishing Machine following a BLAW-KNOX Spreader

These two units make a combination that will give you lowest-cost, minimum of manual operation and highest quality of concrete paving construction for roads and airports, regardless of the type of mix. This modern paving combination will handle the output of two dual-drum pavers to give you record-smashing production.



Paving Forms for Roads and Airports

Aggregate Batching Plants

Steel Street Forms

Concrete Buckets

THE FOOTE CO., INC.
Subsidiary of Blaw-Knox Co.
NUNDA, NEW YORK

Representatives in Principal Cities
Export Department: 342 Madison Ave., New Y
Cable Address: Blawknox, Pittsburgh

...with BLAW-KNOX!

How would you do this job? Equip the MultiFoote High Lift Boom. Look how easily the job is speeded up over in your mind the equipment this paver is replacing by pouring direct to forms. The High Lift Boom really cuts your concrete handling costs.

NOW you solve your concrete problems all the way from rough subgrade to finished slab with one complete line of paving equipment. One manufacturer—one responsibility—Blaw-Knox gives it to you in one package.

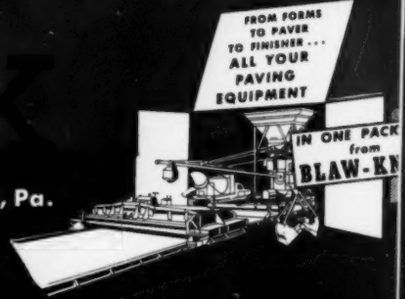
Take the Big MultiFoote DuoMix 34-E. There's a powerhouse of a double drum paver that you can count on to keep ahead of the rest of the high-speed Blaw-Knox line.

Its high operating platform permits full vision without the operator having to do a dance to see both ends and the middle. The Rotary Transfer and Rotary Discharge mean greater speed in the place where speed can be increased. The Multi-Feed Bucket delivers a shovelful or a barrowful. These and other MultiFoote advantages all mean higher speed, better control, easier upkeep and in the end—profit.

There are more MultiFoote Pavers in service than any other make. There must be a reason!

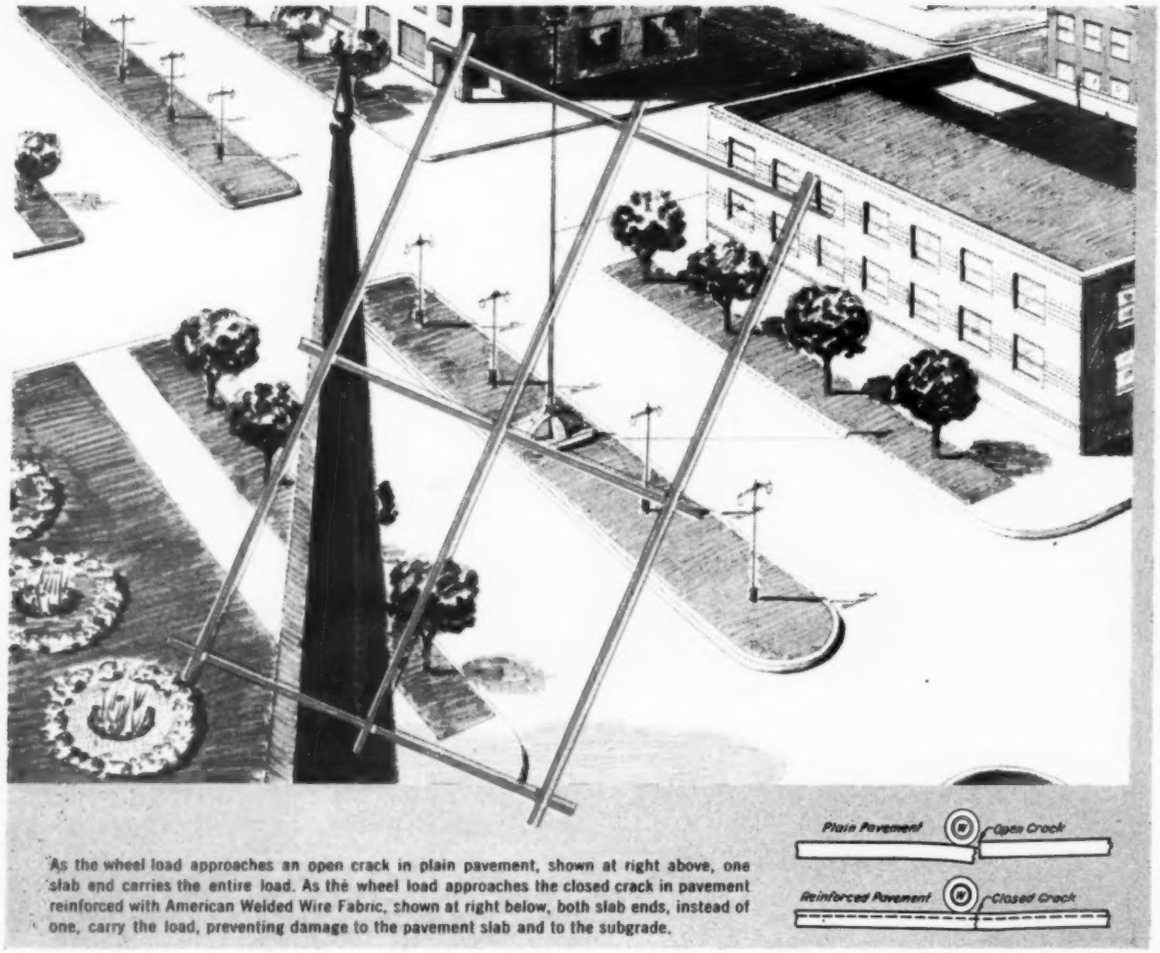
Specify MultiFoote and Blaw-Knox Paving Equipment

BLAW-KNOX



BLAW-KNOX DIVISION OF BLAW-KNOX CO., Farmers Bank Bldg., Pittsburgh 22, Pa.

New York • Chicago • Philadelphia • Birmingham • Washington



As the wheel load approaches an open crack in plain pavement, shown at right above, one slab end carries the entire load. As the wheel load approaches the closed crack in pavement reinforced with American Welded Wire Fabric, shown at right below, both slab ends, instead of one, carry the load, preventing damage to the pavement slab and to the subgrade.

To prolong pavement life and reduce pavement costs

buy American Welded Wire Fabric

• In the streets of many cities, American Welded Wire Fabric is widely used to reinforce concrete pavement. The many, closely spaced, small members, of cold-drawn, high yield-point steel, with rigidly welded cross wires, strengthen the entire slab. They fortify the pavement against traffic load-impact, expansion and contraction, irregularity of sub-grade and other conditions that cause cracking.

When cracks do occur, American Welded Wire Fabric prevents pumping of subgrade, spalling, ravelling, and progressive breakage. This positive crack control reduces maintenance costs.

Standard styles of American Welded Wire Fabric—many of which are held in stock—are the most effective and economical reinforcement for concrete pavements. You can get specific information about the style of U·S·S American Welded Wire Reinforcement you should use, from our nearest sales office.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Every concrete paving job needs

USS

AMERICAN WELDED WIRE FABRIC *reinforcement*

UNITED STATES STEEL

Announcing the NEW

LIMA TYPE 1002

Convertible SHOVEL, CRANE and DRAGLINE

Features

- Precision Air Control
- Anti-Friction Bearings
- Independent Chain Crowd on Shovel Boom
- Truck base—one-piece double annealed steel casting
- Rotating base—one-piece reinforced annealed steel casting
- Dependable Diesel power unit
- Tubular Dipper Handle
- Extra long, wide crawlers
- Large diameter cable drums
- Extra large, point sheaves
- Modern full vision streamlined cab
- Independent Propel (Optional)

—and many others.

This new addition to the LIMA line now makes available a convertible unit with 2½-yard shovel and 61-ton* crane capacity. Like all LIMA machines, the 1002 is engineered and built for maximum output at low operating costs and with minimum maintenance. It is equally effective as a shovel, crane or dragline, and readily converted from one to the other. Tested "on-the-job" for many months under the most gruelling conditions, it has established new records for speed and stamina. We proudly present it as the outstanding machine in its field.

Other LIMA excavators include Shovels—¾ to 6 yards, Cranes 13 to 110 tons and Draglines variable. Write for descriptive bulletins.

*With 60-foot boom at 12 foot radius.

It will pay you to consult your nearest Lima Sales Office or representative before you buy your next shovel, crane or dragline. Offices in principal U.S. cities.

Lima Shovel and Crane Division

LIMA, OHIO

OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

LIMA HAMILTON CORPORATION

Frank Mashuda Company, Portersville, Pa., has the contract to construct a new 12-mile 3-lane section of U. S. Route 422 between Mt. Chestnut, Pa., and U. S. Route 19. The project involves moving over 1,300,000 yards of earth and rock. Gulf quality lubricants and fuels are helping to keep the job well ahead of schedule.

Gulf Products *keep equipment rolling*

help prevent delays **on big highway job!**

Frank Mashuda Company is one of many leading contractors who have found that the use of Gulf quality petroleum products insures smooth, dependable equipment performance and low maintenance costs.

Gulf gasoline and Diesel fuel are clean burning, have exceptionally low carbon content, and provide more efficient power. Gulf quality lubricants provide an extra margin of protection—prevent excessive wear that leads to mechanical delays.

Gulf Lubricants and Fuels team up to help contractors do a speedier, more profitable job!

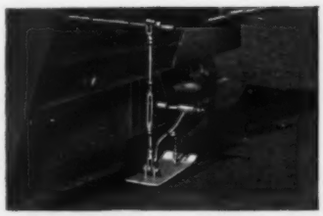
Gulf Oil Corporation • Gulf Refining Company

Division Sales Offices:

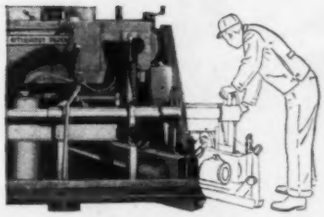
Boston • New York • Philadelphia • Pittsburgh • Atlanta
New Orleans • Houston • Louisville • Toledo

GULF

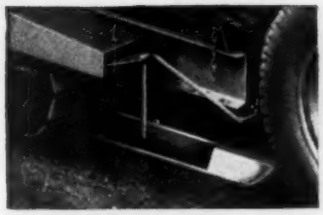
the Paver of the future - Jaeger's BP-5



1. AUTOMATIC MATCHING of any adjacent course, curb, gutter or other grade line.

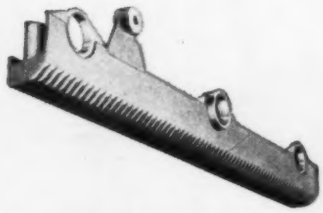


2. TWIRL A WHEEL TO CHANGE WIDTH: Lays any width 5'8" to 12'6", without adding parts.

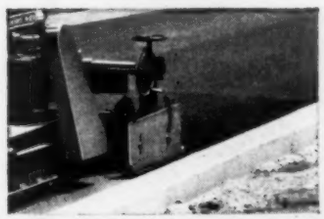


3. SMOOTHEST RIDING SURFACES: 12' longitudinal floating runners equalize screed level.

4. NO PREMATURE SEALING: Weight and traction are on the hard subgrade or completed course —never on the newly-laid surface.



5. MORE UNIFORM MAT: Fast-oscillating, bevel-toothed screeds, tiltable as needed, work material to a uniform density not possible with tamping.



6. LAYS FLUSH TO CURBS and blends perfect-sealing joints between lanes.

7. BURN-PROOF SCREED HEAT with modern hot air system (up to 500°).

8. EVERY TYPE OF MATERIAL: Hot or cold, laid in thicknesses up to 6" as fast as trucks can deliver to the big 6-ton hopper.

To the basically correct principles of paver design long-proved in earlier model Jaeger pavers, the Model BP-5 adds many important improvements in automatic precision and adaptability to the varied materials and conditions encountered in road, street and airport work. For complete information, see your Jaeger distributor or send for Catalog BP-9. Early deliveries will be limited to orders already on hand.

THE JAEGER MACHINE CO., Columbus 16, Ohio

Leading distributors in 130 cities of the U. S. and Canada sell, rent and service Jaeger paving machines and other equipment listed below.

JAEGER

engineered equipment

COMPRESSORS • DIAGONAL SCREED FINISHERS
SCREW SPREADERS • BITUMINOUS PAVERS

KEEPS TAR "ON TAP" AT 400°F

Penflex interlocked flexible metal hose tops a hot tar handling problem, quickly, efficiently

Solved—another "hot" problem, typical of how Penflex "Flexineering" provides the *right* recommendations for economical, flexible transmission of hot liquids, chemicals, steam, air . . . for *all* industries.

With the help of Penflex engineers, one roofing equipment manufacturer developed a unique method of passing hot tar from heater on ground level up to the roofing crew. Using 1½" Penflex interlocked metal hose, a tar circulating system was designed, from heater to roof tank . . . leak-proof and safe.

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Yes—Penflex "Flexineering" (the science of engineering each type of flexible tubing to the problem) is ready and willing to solve problems for all industries, whether they pertain to product design, production, or maintenance. For prompt, efficient service on precision-made flexible metal hose, tubing, and couplings from ⅛" I.D. to 30" I.D., write today to . . .

PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.

7216 Powers Lane **Philadelphia 42, Pa.**

Branch Sales Offices—BOSTON • NEW YORK • CLEVELAND • CHICAGO • HOUSTON • LOS ANGELES

Penflex... HEART OF INDUSTRY'S LIFE LINES

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Maintenance

made easy and economical with the

OLIVER-HENKE MAINTAINER

Here's a light, economical road maintainer that gives you many features usually found only on much heavier, more costly machines. Rugged construction . . . finger-flip hydraulic controls . . . blade angle easily adjusted from driver's seat . . . leaning wheels . . . hydraulic scarifier . . . hydraulic steering . . . 12-foot blade . . . plus many other important advantages are yours with the OLIVER-Henke Maintainer.

The powerful OLIVER Model 88 Industrial Tractor gives the unit plenty of power for economical maintenance of gravel and dirt roads and light ditching work. The famous OLIVER "Fuel Miser" engine with variable speed governor assures minimum fuel consumption. The entire unit is easily accessible for service. All wearing parts can be inexpensively replaced if necessary. And, if desired, the tractor can be readily removed from the Maintainer and a front-end loader quickly installed.

For efficient, economical road maintenance, the OLIVER-Henke Maintainer will effectively augment your heavy equipment and do a large share of the work at reduced operating costs. Ask your OLIVER Industrial Distributor to show you the outstanding economy of this unit.

The OLIVER Corporation

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

"THE SIGN OF EXTRA SERVICE"

A Complete Line of Crawler and Industrial Wheel Tractors

TONCAN IRON SECTIONAL PLATE PIPE AND ARCHES

Low Installation Costs—Light weight makes them easy to haul, handle, erect . . . in any weather . . . with unskilled labor. Shipped "knocked-down"—individual plates and special bolts arrive on job in one complete lot—save freight.

Long Life—Strong, resilient . . . carry tremendous loads safely . . . will not crack or crumble in hauling or in use. Resist damage due to vibration, impact, severe weather changes, settling earth and other causes. Resist rust and corrosion—contain twice the copper used in copper-bearing irons and steels, *plus* molybdenum. Assure lowest cost per year of service. Two-inch corrugations mean even higher strength . . . wider spans . . . greater economy.

100% Salvage Value—Can be re-used without loss.

Save Money!

Write for full information and engineering data.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO

Manufacturers of Toncan Iron Drainage Products

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Toncan® Copper Molybdenum Iron is available in:

CORRUGATED METAL PIPE • PERFORATED CORRUGATED METAL PIPE • CORRUGATED METAL PIPE-ARCH • CORWEL SUBDRAINAGE PIPE
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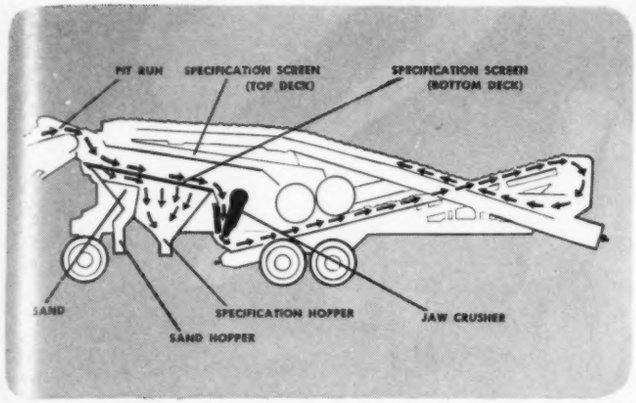
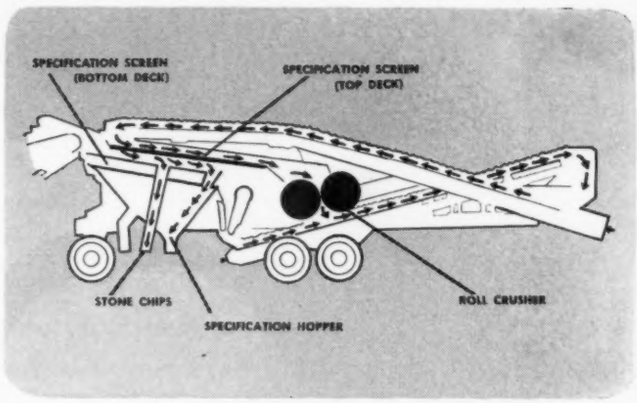


1 **PIT RUN** is fed to bottom deck of 3½ deck screen, eliminating scalping screen. Sand is rejected by half deck. Throughs go to pay hopper, they never reach a crusher. Oversize goes to jaw crusher where "force-feed" increases production.

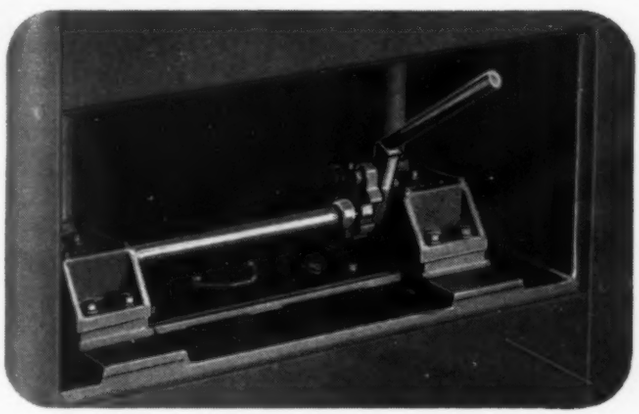


2 **ONLY CRUSHED ROCK** is screened by top deck. Specification material is *chuted around bottom deck*—not through it. Top deck produces independently from bottom deck doubling the effective screening area. Stone chips can be produced without extra equipment.

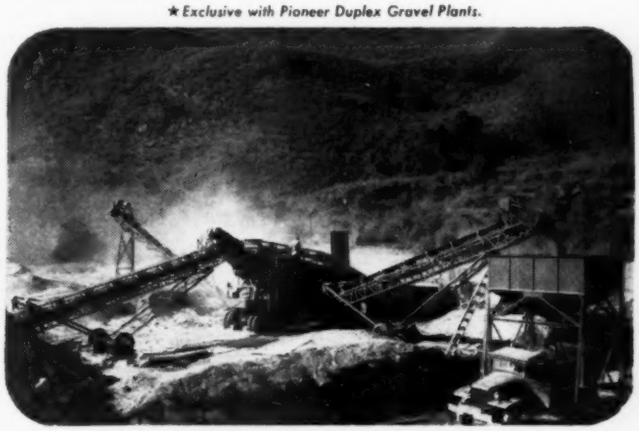
Only bottom deck feed★ gives you these 2 high output features—

- ***TWICE THE PAY SCREENING AREA*** because both top and bottom decks produce specification material—independently—at the same time.
- ***MORE CRUSHING CAPACITY*** because the load can be balanced between the crushers *without stopping the plant.*

★ *Exclusive with Pioneer Duplex Gravel Plants.*



3 **THIS SIMPLE RATCHET** on the jaw crusher balances the load between the two crushers *while the plant is operating.* It is not necessary to change screens. When material is coarse, the jaw is opened. If pit run is fine, the jaw is closed.



4 **PIONEER MAKES FOUR SIZES** of duplex gravel plants with bottom deck feed. This Diesel-Electric Plant is the fifth bottom deck feed plant owned and operated by Winston Brothers. A new booklet tells all about bottom deck feed. Send for it today!

BUY BOTH!

Higher Output, Lower Upkeep!

Pioneer

Continuflo **EQUIPMENT**

NEW BOOKLET!

PIONEER ENGINEERING WORKS
1515 Central Avenue
Minneapolis 13, Minnesota

Please send me your new booklet telling all about Bottom Deck Feed.

NAME_____

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CITY_____ STATE_____

NO MATTER *HOW* YOU FIGURE

YOUR BEST BUY IS . . .

CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL

WHEN YOUR POWER IS INTERNATIONAL

Base your bidding on big pay yardage. Fit International Tractors and matched earthmoving equipment into your planning and reduce the downtime on your jobs. Rugged Internationals are built to carry on, hour after hour, day after day at minimum cost for fuel, lubricants and maintenance. And because they are backed up by a nation-wide, localized service organization, you have assurance of long-term satisfaction from Internationals.

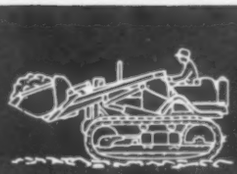
Before you figure your bids, check your power and equipment needs with your International Industrial Power Distributor. He sells and services the full line of International tractors and International-powered earthmoving equipment. NO MATTER HOW YOU FIGURE — here is the power and equipment that will dig in and move profit-making yardages.

INTERNATIONAL HARVESTER COMPANY, Chicago

INTERNATIONAL HARVESTER

Hear James Melton and "Harvest of Stars" every Sunday, NBC. See your local newspaper for time and station.

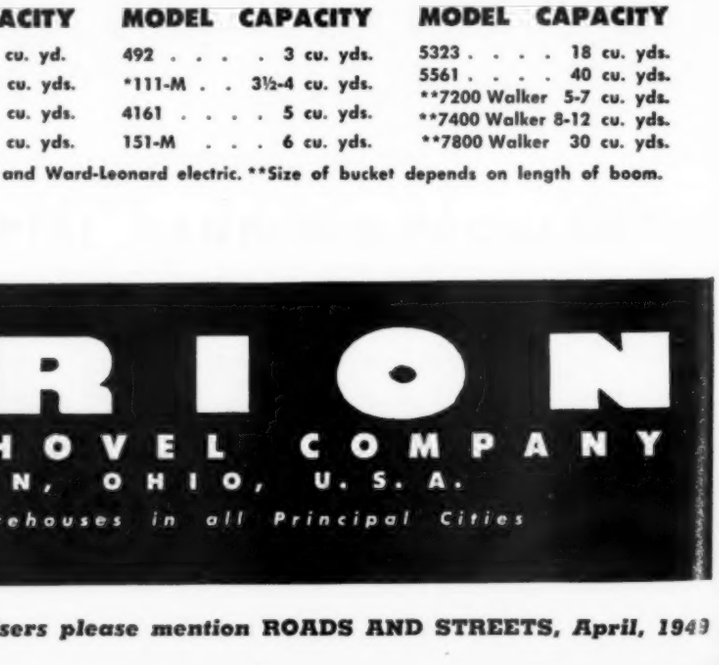
Industrial Power



For BIGGER and BETTER yardage in tough digging

SWITCH TO THE MARION LINE FOR '49

Do your '49 jobs call for high yardage in tough digging? Put a MARION on the job this year and get a new conception of dependable service in heavy duty digging



HERE IT IS!

MODEL	CAPACITY	MODEL	CAPACITY	MODEL	CAPACITY
33-M	¾ cu. yd.	492	3 cu. yds.	5323	18 cu. yds.
362	1½ cu. yds.	*111-M	3½-4 cu. yds.	5561	40 cu. yds.
372	1¾ cu. yds.	4161	5 cu. yds.	**7200 Walker	5-7 cu. yds.
*93-M	2½-3 cu. yds.	151-M	6 cu. yds.	**7400 Walker	8-12 cu. yds.
				**7800 Walker	30 cu. yds.

*Diesel Clutch type and Ward-Leonard electric. **Size of bucket depends on length of boom.

from ¾ cu. yd. to 45 cu. yds.

MARION

POWER SHOVEL COMPANY

MARION, OHIO, U. S. A.

Offices and Warehouses in all Principal Cities

Instant, constant contact between headquarters, section foremen and road crews. Saves money as it speeds operations.

A NEW VITAL ROAD TOOL!

Motorola
FM 2-WAY RADIO

Eliminate waste motion . . . wipe out "dead" mileage . . . expedite every phase of your operation by keeping your foremen, supervisors and main office in direct, split-second contact all through a job. Motorola 2-way radio puts your main office within fingertip control of every operation . . . constantly alert to the problems and progress . . . immediately informed of accidents or needed equipment. Especially ideal where your road crews are spread out over a long stretch of highway, Motorola 2-way radio keeps them closely allied for top efficiency. Many enthusiastic users report that in savings alone it has paid for itself in one month of operation.

Motorola 2-way radio has been tested and proved in the world's largest FM 2-way mobile radio laboratories to outlast and outperform all others—bar none! Motorola's mature design . . . inspired engineering, and faultless construction from only the best materials is your guarantee that the Motorola equipment you buy today will be years ahead of the field . . . for years to come!

Find out how *Motorola* 2-WAY RADIO can increase the efficiency of your specific road job . . . . . .

MAIL THIS COUPON TODAY!

MOTOROLA, INC.
Communications Division
4545 Augusta Blvd.
Chicago 51, Illinois, Dept. R.S. April

Please send to me complete details of 2-way radio in industrial applications.

NAME .....
POSITION .....
COMPANY .....
TYPE OF BUSINESS .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

Motorola Inc.

COMMUNICATIONS DIVISION
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In Canada: Rogers Majestic Ltd., Toronto — Montreal

DUMPTOR no-turn shuttle STEPS UP OUTPUT 11.6%

You save 2 slow turns every trip ... travel at same speed both ways

You save turn time . . . gain more productive haul time on shuttle hauls with Dumptors because Koehring constant-mesh transmission makes the same three speeds available in either direction. Time studies prove that elimination of two turns every trip — one at the loading unit, one at the dumping unit — often saves as much as 30 seconds every round trip. On a 1,000' haul (15.4 round trips per hour) Dumptor No-Turn Shuttle Operation gains 7.7 minutes every hour. Table at right quickly shows you what this factor alone can mean to you in extra yardage gained.

What's more — fast, easy spotting and 1-second gravity dump keep production high. For faster hauling on your off-the-highway jobs, see your Koehring distributor TODAY.

FAST, EASY SPOTTING...SAVES HAUL TIME...DUMPS

KOEHRING COMPANY

Subsidiaries JOHNSON • KWIK-MIX • PARSONS

Haul per UNIT

Typical 1000' Haul — Fair Road		
	No-Turn Shuttle Operation	2-Turn Shuttle Operation
Time Per Trip	3.9 min.	4.4 min.
Trips Per Hr.	15.4	13.6
Yards Per Hr.	69	61

(4.5 Yd. Payload)

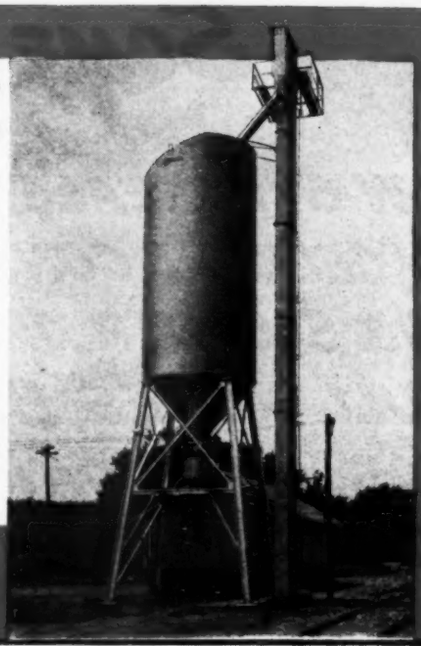
Yardage Gained — 8 yds.
(11.6% per unit per hour on 1000' haul.)

IN ONE SECOND

MILWAUKEE 10, WISCONSIN

Johnson Single Silos for Big Storage . . . Flexibility

Johnson all-welded single silo provides 254, 373 and 492 bbl. cement capacities . . . has gasoline or electric-driven screw conveyors and bucket elevator . . . box-car or truck receiving hoppers . . . electric bin signals . . . aeration diffusers . . . one or two 1,000 lb. cap. batchers. Adding second silo at ground level nearly triples storage capacity.



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CHAMPAIGN, ILLINOIS
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Straight, Clean Trenches for Sewers, Pipe, Water Mains

Parsons 250 Trenchliner*, product of more than 40 years of trencher building experience, incorporates all the desirable features that make money for you on trenching jobs. Telescoping boom for easy depth adjustment. Shifts from side to side across full Trenchliner width.

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PARSONS COMPANY NEWTON, IOWA
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New Handy Tower Loader for Kwik-Mix 11-S Dandie*

Now you can discharge concrete batches into trucks and hoppers above ground level with Kwik-Mix 11-S Dandie. New tower loading attachment has 9'-2" discharge height. Bucket handles full batch . . . is powered by mixer engine . . . discharges automatically at top of tower. Also available in big 16-S. Get full facts today.

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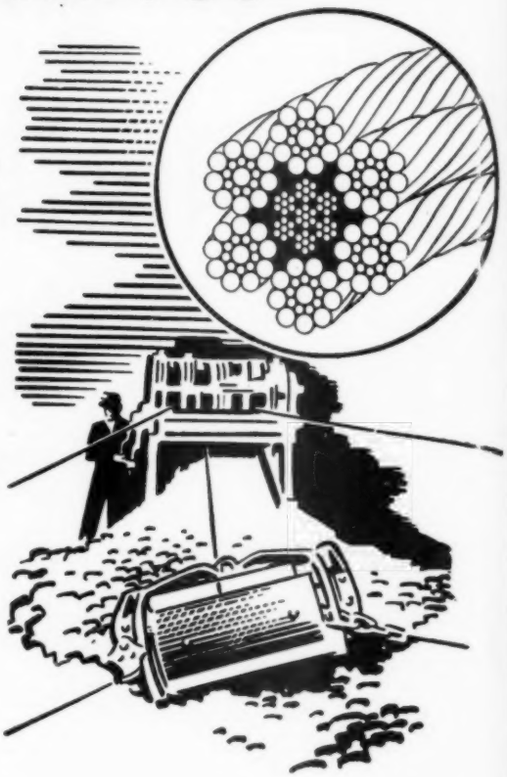
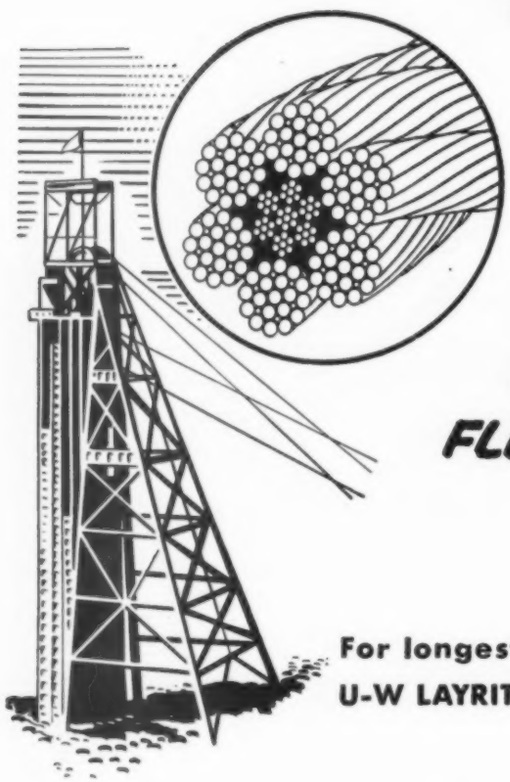
KWIK-MIX COMPANY PORT WASHINGTON, WISCONSIN
KOEHRING SUBSIDIARY

SOME ROPES FOOL YOU

U-W 6×19 SEALE IS AN EXCELLENT CONSTRUCTION FOR SLUSHER OR SCRAPER PULL ROPES BECAUSE IT HAS VERY COARSE OUTER WIRES TO RESIST ABRASION



BUT...



FOR MINE SHAFT ROPES U-W 6×19 FILLER WIRE IS BETTER BECAUSE IT IS MORE FLEXIBLE AND RESISTS FATIGUE EXCEPTIONALLY WELL.

For longest and best service, always specify U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL

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AXLES

Allow Engines to Run at most Efficient Operating Speeds

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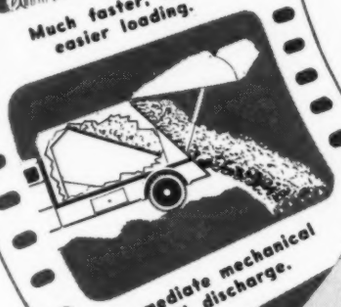
The streamlined SANIVAN Garbage Collection unit is a credit to any community. It is visual evidence of a progressive efficient administration. It leaves streets cleaner and healthier. Each unit requires less men, less energy and less time. The SANIVAN scores on all points.

Much faster, much easier loading.



Immediate mechanical full discharge.

With SANIVAN'S Loading Hopper at waist level there is no over exertion or time loss.

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"Yard-by-yard" loading and full hydraulic unloading are exclusive to SANIVAN.

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3 cu. yds. ordinary loose garbage.

Become 1 cu. yd. compressed garbage.

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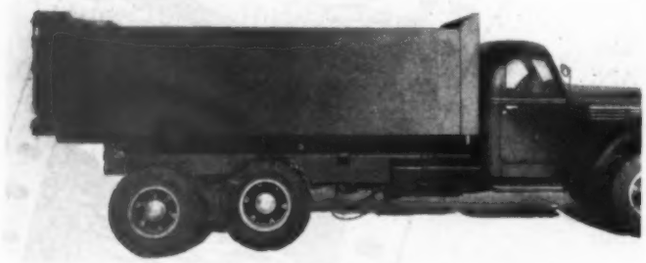
Photos show PERFECTION No. 354 Special Dump Body and No. 1027 Iso-Draulic Roll-A-Lift mounted on International truck. Length of body 192", width 96", capacity 16 yds. Can be made in various sizes.

On this PERFECTION Body the triangular side braces are placed on the INSIDE of the side plates--permitting the sides to be mounted flush with edges of the platform. This design increases the inside dimension between sides almost one foot, resulting in greater volume capacity. In comparison with bodies having outside braces, this design also has the advantage of permitting the use of a smaller body for any given volume capacity requirement. This reduction in body size may be in height, length or width, as desired.



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FOR ANY TRUCK STANDARD or SPECIAL UNITS IN ALL SIZES - FOR ANY USE

hydraulic raising and lowering system is found only on

★LITTLEFORD HIGHWAY BROOMS

Traction Driven Broom model no. **106**

LITTLEFORD Power Driven Model 108 and Traction Driven Model 106 Highway Brooms have the Hydraulic System for raising and lowering the Broom—and too, this hydraulic system saves wear on the broom, because the tension on the road surface can be regulated. There's no need to have the full weight of the broom resting on the road surface.

model no. **108** *power drive*

MONO-FRAME CONSTRUCTION of the Littleford Highway Brooms makes these units sturdy, yet light weight, gives the operator better vision of the broom, makes it easy to handle and shortens the turning radius.

TWO-WAY BROOMS—Both Littleford Brooms can sweep in either direction and it takes only 30 seconds to change from one direction to the other. Both models can be equipped with Sprinkler System and model 108 Power Driven can be equipped with a Dust Blower Unit.

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17,000 Square Yards

of airport sub-base a Day!

In airport work, as in road making, the P&H Single Pass Soil Stabilizer is setting new standards of performance, speed and economy.

For example, on runway construction of the Omaha Municipal Airport, the P&H Stabilizer processed 1900 sq. yds. per hour — for a total of 17,000 sq. yds. in *one 9-hour working day.*

Three materials — gravel, sand, clay — were required to make an 8-inch soil-aggregate subbase for a 12-inch concrete pavement. The subbase was laid in two 4-inch layers (compacted).

The *one* P&H Stabilizer in *one* pass per layer with just *one* operator performed all stabilizing operations — to meet specifications exactly. Less equipment was required for the job, less supervision was needed because equipment was "bunched" in a smaller area.

AIRPORT PROJECT FACTS

LOCATION — Omaha, Nebr. Municipal Airport.
SIZE OF PROJECT — Runway 7,000 by 155 feet wide.
DEPTH OF SUB-BASE — 8-inches (compacted) laid in two 4-inch layers.
TYPE OF SOIL AGGREGATE — Gravel (from commercial source), fine sand (from deposit on site), clay (imported from source 3 miles from airport). Mixed, including water, compacted to density of 142 lb. per cu. ft.
RATE OF PRODUCTION — Reached 1900 sq. yds. per hr., 17,000 sq. yds. per 9-hour day.

You can build excellent, all-weather surfaces — secondary highways, streets, base courses, airport runways, etc.—more quickly with the P&H Stabilizer. Ask for the facts.

Color sound pictures on P&H Stabilizers are available. Write for information today.

Making maximum use of native materials, the P&H Stabilizer shaves and pulverizes, maintains true subgrade, applies liquid, final mixes, and spreads to a uniform depth — and does it rapidly.

P&H

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PUSH-PULL for POWER PLUS Bucket-Loads

Hydraulically controlled bucket is shown above at load start position. Double action cylinders are placed in power plus horizontal thrust position. Note powerful triangular construction.

Hydraulic Bucket control permits slow or fast dumping. Loaded bucket can be leveled throughout lifting operation. Start of controlled dump is shown in illustration above.

THE OTTAWA DOUBLE ACTION INDUSTRIAL LOADER

Dual Hydraulic operation throughout. The bucket is hydraulically controlled by a powerful pair of double action cylinders. This feature adds many operational uses never before found in loaders of its price range.

High capacity double action lift cylinders make the Ottawa "Double Action" outstanding in the loader field. Down pressure on lifting cylinders adds excavating to the long list of material handling operations possible with the New Ottawa. Here is a loader that lifts, loads, digs and builds stock piles as well as functioning as a material leveler and spreader.

Now available for following tractors:

Minneapolis Moline RTI—UTI—UTIL
International Harvester I-4—I-6—ID6—I-9—ID9
Case SI—DI—LAI

It's new—It's a feature your customers have been looking for—It's low cost—
It's economical — Write today for complete details and price list.

The Ottawa INDUSTRIAL HYDRAULIC FRONT END LOADER

Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

4 important advantages

- **Better wetting or coating of aggregate**
- **Greater stickiness and binding quality**
- **Faster setting of roads**
- **Blacker appearance**

Now, you can build longer-lasting secondary roads in less time and at lower cost! Roads laid with the improved Standard Road Oils will wear longer because the aggregate is bound tightly into the road surface. Faster setting will mean less traffic delay. You'll do the job in less time.

Ask a Standard Oil Asphalt Representative for all the facts about these improved road oils. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

DARD OIL COMPANY (INDIANA)

STANDA

HANDY HARD-FACING KINK

with a bargain of up to 5 times more life!

TO MINIMIZE GRADER BLADE WARPAGE during hard-facing, experienced welders bolt two blades together, exposing the leading face of each for applying TUBE BORIUM or BOROD.* Warpage of one is automatically compensated for by the other. Need for straightening is reduced and up to 5 times more service life can be expected than from unprotected blades.

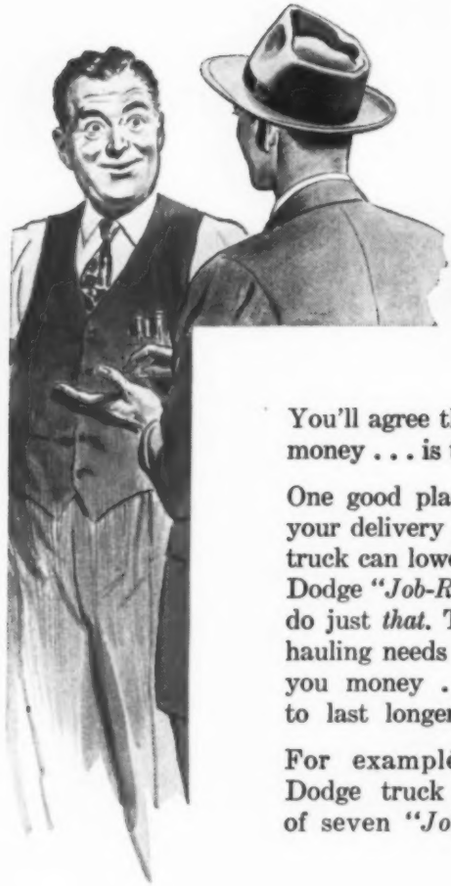
HOW TO GAIN EXTRA GRADER BLADE LIFE

Apply parallel beads of $\frac{3}{16}$" 20-30 ELECTRIC TUBE BORIUM along bottom edge in a band 2" wide or less. Alternate the application of each bead between blades. Tube Borium assures a sharp cutting edge with maximum life under *severest abrasive conditions.*

This blade was protected with stringer beads of BOROD—a Stoody Alloy similar to Tube Borium but with much finer tungsten carbide particles. Excellent results are experienced where *both impact and abrasion are present.*

TUBE BORIUM and BOROD are two Stoody Alloys composed of Tungsten Carbide particles encased in mild steel tubes. They differ chiefly in size of particles, BOROD deposits being almost homogeneous in character. Both these alloys, as well as all other Stoody hard-metals, are available from your Stoody Dealer. Ask him for literature and recommendations on your wear problems.

STOODY COMPANY 1125 WEST SLAUSON AVENUE, WHITTIER, CALIFORNIA



ROAD BUILDERS:

Lower Delivery Costs Mean Lower Overhead

You'll agree that a good way to *make* money . . . is to *save* money.

One good place to watch costs is in your delivery operation. For the *right* truck can lower delivery costs plenty! Dodge *"Job-Rated"* trucks are built to do just *that.* They're built to *fit* your hauling needs . . . save you money . . . and to last longer.

For example, every Dodge truck has one of seven *"Job-Rated"* truck engines. It is a high-compression engine of advance design . . . which insures maximum efficiency, with "top" economy.

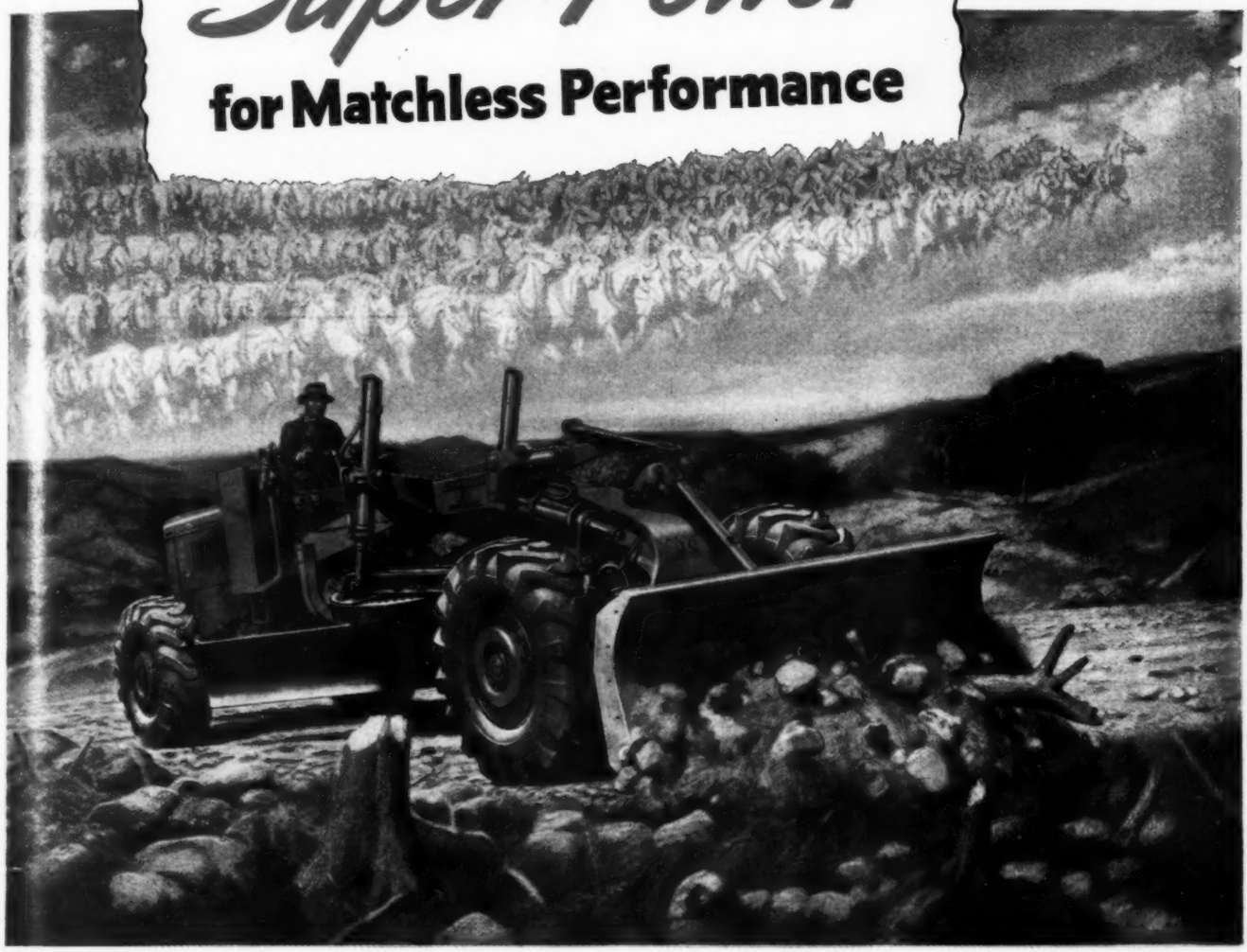
Each has exactly the right clutch, transmission, rear axle, and every other unit . . . *"Job-Rated"* for maximum dependability, and long life.

Let your Dodge dealer tell you the whole *"Job-Rated"* story. You'll quickly realize his story makes sense! And remember . . . *only* Dodge builds *"Job-Rated"* trucks.

For the good of your business—

Switch to "Job-Rated" DODGE TRUCKS

Super-Power
for Matchless Performance



There is No Substitute for All-Wheel Drive and All-Wheel Steer in a motor grader . . . no way in which any rear drive, front steer machine can equal the maneuverability, power-at-the-blade, and all-around performance of an Austin-Western "88" or "99".

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All-Wheel Steer provides unequalled maneuverability; saves time on every job; makes it possible to work in places where ordinary motor graders cannot go—do things they cannot do.

Get the complete story of the many additional features of these outstanding graders from your A-W distributor, or send for the latest bulletins.

AUSTIN-WESTERN COMPANY, AURORA, ILL., U.S.A.

BUILDERS OF ROAD MACHINERY SINCE 1859

Austin Western

The 14-ton key to the city haul!

WHEN THIS SUBWAY excavation began, one problem was to find trucks that could truck the muck 24 hours a day and set a profitable pace over a route, 128 city blocks long!

These International six-wheelers could—and did! They took the muck, 8 yards at a crack, to a dump 8 miles away. Sure, they did it like they were made for the job. They *were!*

This operation required specialized equipment built for the job. The heavy-duty 6 x 4 International KB-11-F was selected. Reinforced side rails withstand unusual shock stresses of big loads dropping into the bed from elevated loading hoppers. The special power divider with integral auxiliary transmission provides a low creeper gear for pulling out of bad spots and an axle ratio coordinated with the main transmission to provide cruising speeds required to meet the schedule. Because of the heavy loads hauled through heavily congested areas, large-size heavy-duty air brakes were installed to insure safe operation.

That's what International means when it says it builds trucks *specialized* for the job. International offers 22 basic models, with gross weight ratings ranging from 4,400 to 90,000 pounds. And it forms 1,000 different truck combinations from 'em—one for every load, road, and haul.

And International's service facilities are just as complete as the line of trucks it offers. 4,700 International Dealers and 170 company-owned Branches are waiting to wait on you . . . any place . . . any time.

So whether you're working on a subway or a skyscraper, a sewer or a sausage factory, International offers a complete line of trucks specialized to the job. A call to your nearest International Dealer or Branch will put you on the right track to the right truck. Why not put in that call right away!

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Tune in James Melton and "Harvest of Stars"
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INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY • CHICAGO

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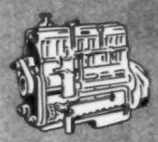
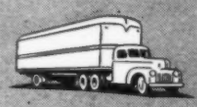
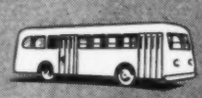
RAILROADS

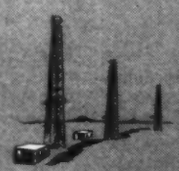

ENGINES

ROAD EQUIPMENT


HEAVY HIGHWAY EQUIPMENT

MARINE EQUIPMENT


BUSES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FLEXIBLE HOSE LINES with DETACHABLE FITTINGS

Easily assembled in your own shop.

Operating temperatures from —40° to +275° F.

For use with hydraulic fluids, lubricating oils, water, air and many other fluids.

DEALERS AND DISTRIBUTORS WANTED
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Allow separation and reconnection of fluid-carrying lines without loss of fluids or inclusion of air. 1 coupling takes the place of 2 hand-operated valves.

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AEROQUIP CORPORATION
JACKSON, MICHIGAN

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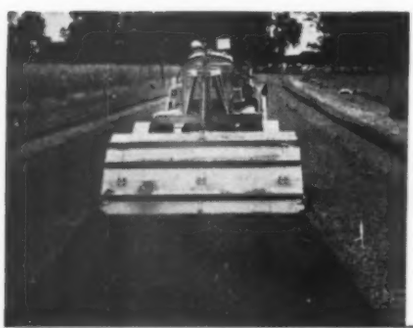
Base Your Estimates on a SEAMAN Pulvi-Mixer

Get the real "low-down" on mixing costs — check the records Seaman Mixers have been making all over the country on all types of jobs.

Here is a mixer that is versatile . . . can handle a wider variety of mixing and pulverizing jobs . . . costs less to own and operate than any other type . . . that does as much work per hour as the largest machines and produces a mixture of the highest quality by actual test. Before you start your next job — get the facts from Seaman.



Bituminous

The Seaman Pulvi-Mixer handles all types of bituminous mixing with equal efficiency either in-place or from windrows, on new construction or resurfacing jobs.

Processing with a Seaman assures a mix of uniform density; LATERALLY . because of the pitch of the tines, LONGITUDINALLY because of the forward carry-over in the hood; VERTICALLY " because of the adjustable depth control. You blend out "rich" and "lean" spots — compensate for variable aggregates — aerate excessive moisture in materials — and leave a shaped, level, graded surface ready for rolling.

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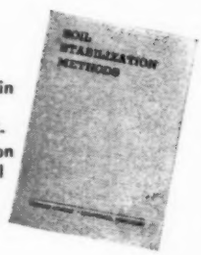

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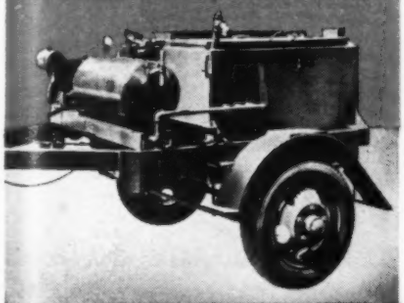

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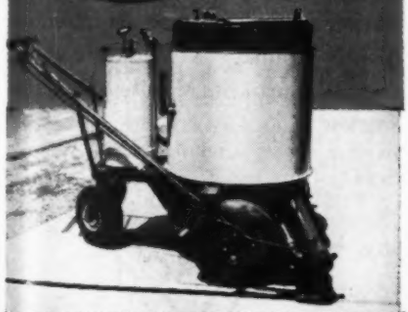

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GOODYEAR

MORE YARDS ARE MOVED ON GOODYEAR OFF-THE-ROAD TIRES THAN ON ANY OTHER KIND

ROADS AND STREETS

April, 1949 • Vol. 92 • No. 4

1,300,000 Yds. Monthly at

Cherry Creek Dam

Design and construction features of flood control project which includes a 13,000,000 cu. yd. rolled-fill dam; 3,000,000 cu. yd. of spillway excavation; and 32,000 cu. yd. of structural concrete. A $1,700,000 equipment show, with Phelps-Wunderlich & James on earthwork and Al Johnson Construction Co. on structures

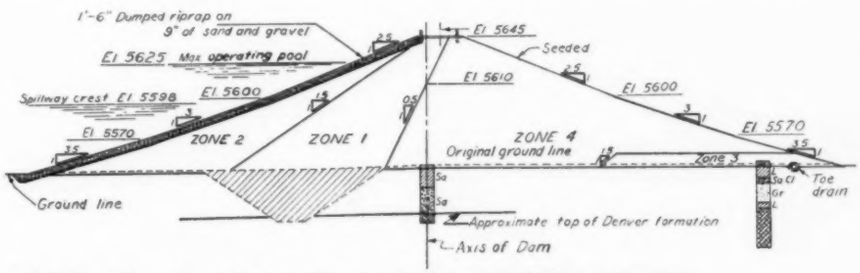
ONE of the rip-roarin' Western projects of recent months is Cherry Creek Dam and Reservoir, located six miles southeast of Denver. Designed and supervised by the Denver District, Corps of Engineers, it has many features of interest to engineers and contractors. Its primary purpose is to end the periodic flash floods that have caused tremendous property damage as the creek courses through Denver. The project will eventually contribute to storage of irrigation water, to be diverted under the U. S. Bureau of Reclamation's contemplated Blue River Diversion Plan. To protect the earth dam against any chance of over-topping in event of occurrence of an unpredictable flood, a spillway canal diverting into a small creek, thence into the South Platte River and bypassing Denver, has been provided. Flood waters will be stored and will then be released through a concrete outlet structure at flows up to 5,000 sec.ft.

Design of Dam

The dam is a rolled-fill structure nearly 3 miles long at the crest. Height above streambed, 140 ft. max.; width at top, 30 ft.; width at bottom, 1,200 ft. max. Estimated embankment, 13;000,000 cu. yd. The upstream face, sloped 4 to 1 below high water line and 2½ to 1 above the line, will have an 18-in. layer of dumped riprap, consisting of granite or basalt stones graded from 300-lb. down to 10-lb., bedded on a 9-in. layer of sand and gravel.

As shown in the cross-section, the fill proper consists of three zones. The upstream zone consists of pervious material, specified to have not more than 10% minus-200-mesh material by weight. Next is a prism of impervious material, specified 10% to 35% clay. The remainder of the dam is specified to consist of random material, characterized as semi-pervious. The downstream face will be topsoiled, fertilized, seeded, and mulched.

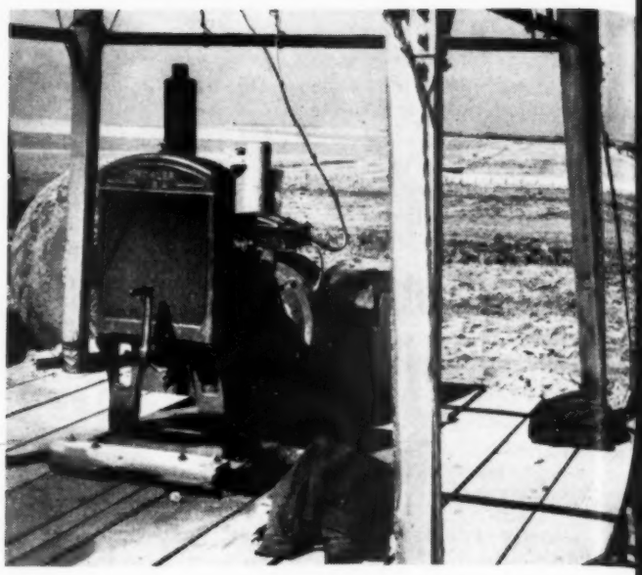
At varying levels under the present



★ Profile of dam. Note riprapped up-stream face, zoned fill construction, cut-off trench, pervious blanket under toe

★ Row of 45-ft. towers for floods—set to one side during day shift and skidded to the centerline of the dam at night

★ One of the big Lima's loading from borrow pit



★ (Upper right): Kohler light plant under one of the big flood towers. This unit also powered two adjoining towers. (Lower right): Rear tires are from junked B-17 bombers. A local shop helped Wunderlich rig up these 5500-gal. 10-wheeler water tanks, fine for rough going

★ LaPlant-Choate scrapers getting pusher service in some tough clean-up work along the outlet apron

★ Caterpillar dozers, working singly or in pairs, blade-to-blade, were used to spread previous zone material. Motor graders spread the clay-zone and random material, where the going was better

creek bed there is encountered at this dam a shale or "bedrock" stratum locally called the Denver formation. The dam foundation includes alluvial deposits overlying this formation, into which a cut-off trench up to 50 ft. deep was excavated under an early contract and backfilled with impervious (clay) material to control seepage under the dam. Also to insure good drainage conditions a blanket of coarse, open sand was placed on the base of the dam, extending some distance back from the downstream toe. The downstream face graduates from 4 to 1 slope at the toe to 2½ to 1 at the crest.

Pressure Relief Wells

As a further precaution, to intercept underseepage, pressure relief wells 50 to 100 ft. deep were carried down to the Denver formation at 150-ft. intervals along the downstream

★ Paul F. Jensen, resident engineer

★ Several hundred acres in this pit—draglines benching around the rim

★ Euclid loader with 54-in. belt took bites as deep as 5 ft. with help of tandem or push-and-pull tractor service (Allis-Chalmers HD-19's)

toe. Wells consist of 6-in.-diameter perforated redwood stave pipe sections. The wells are tied together with the porous blanket and a 30-in. corrugated iron pipe collector line running along the toe.

The actual settlement of the foundation during construction is measured by settlement gauges placed during fill construction. Pressure cells were also installed in the clay or impervious section of the dam, to determine the rate of placement permissible without building up excessive pore pressures.

Wunderlich Contracting Co. (now represented on the job as Phelps-Wunderlich & James) of Jefferson City, Mo., late in 1947 took the dam earthmoving and spillway excavation at about $8,000,000. Their bid included an item of 37c for the approximately 12,000,000* cu. yd. of rolled earth. A large part of this yardage was placed during 1948, and much

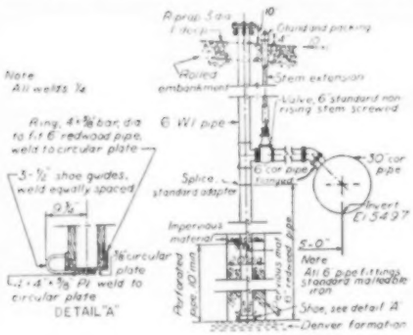
*Approximately 1,000,000 cu. yd. in cutoff placed under earlier contract.

★ Rolling "specs" required 8 to 10 passes minimum with 400-psi. weight on roller feet. Caterpillar tractors worked 4-drum units

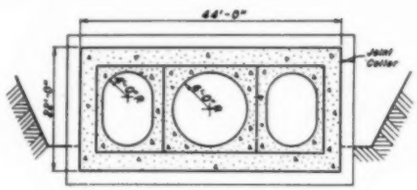
★ Two Le Roi 105 cfm. compressors, one on a cart and one on a truck, powered a battery of Sullivan (Joy) pneumatic tampers. Tampers were used for backfilling adjacent to the concrete outlet structure, and for backfilling trenches after setting pressure cell tube connections

★ Buda boring equipment at work on soil sampling

★ Concrete aggregates took this long belt ride before starting through the Noble automatic batching plant and 2-yd. Smith mixer



★ Details of toe pipe and drain well connections



★ Cross-section of the outlet structure, designed for 10,000 sec. ft. max. flow

progress made on the 3,000,000 cu. yd. of excavation for the spillway canal, which was bid at 59c. This organization's fleet included some of the newest and heaviest equipment. Thirty-eight Euclid 24-yd. bottom-dump wagons, raised to 30-yd. with sideboards, were employed with 3 Euclid Model 9BV loaders (54-in. belts). These units worked in the various borrow pits, of which there were 6 separate areas totaling 2½ square miles in extent, plus two more areas available for emergency use. The extensive borrow areas were peeled down 23 to 35 ft., depending on the materials encountered and the yardage needed.

The 30-yd. loads were often clocked in 40 to 50 seconds, despite wet conditions, this high production being aided by use of tandem HD-19 Allis-Chalmers tractors (of which there were 8 on the job) hooked up either tandem or push-and-pull. Some 38 tractors in all were used on the job.

Caterpillar tractors with dozers spread the embankment material, while 7 Caterpillar No. 12 graders worked haul roads and spread and mixed material on the grade where necessary to obtain satisfactory blending.

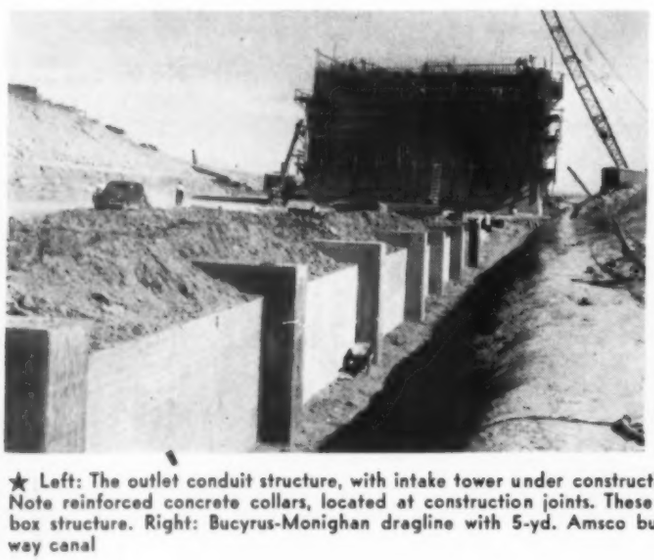
While self-propelled scrapers were not employed on the main dam at all times, due to the heavy going, 7 La Plant-Choate 18-yd. units gave a good account of themselves in certain areas.

Also working the pits, loading to Euclids, were 2 Lima Model 1201 draglines with 5-yd. (oversize) buckets, and one Northwest 80D 2½-yd. dragline with 2½-yd. bucket. Borrow pits, it might be said, were quite a problem from the standpoint of moisture. The arid conditions required that the pits be soaked for periods of as high as six weeks prior to working, in order to get several feet depth of moisture penetration. Even then, constant sprinkling was necessary on the grade for the semi-pervious and impervious zone material. Sprinkling was done with 5 special trucks. Each carried 5500 gal., being able to get over the soft going by virtue of a 10-wheel trailer design embodying landing wheels and tires from junked B-17's. Two smaller (800-gal.) tank trucks also were needed.

This outfit was able to move 50,000 to 60,000 cu. yd. per day working in two shifts, 6 days per week. Haul averaged about ¾ mile. Rolling was performed in 6-in. lifts, with a minimum of 10 passes required in impervious and 8 passes in pervious material, using sheepsfoot rollers with 400 psi. foot pressure. Rollers consisted of 7 dual-dual units with 5-ft. diameter drums, made up specially for this job by Held & McCoy of Denver. Oversized stones (over 5 in.) of which there were few, were picked up by hand and thrown into trucks as work progressed.

Two shifts means night work, and the flood lights blazed at Cherry Creek. Twelve skid-mounted lighting towers, each 45 ft. high, were used, nine of which were equipped with flood clusters totaling 6,000 watts candlepower and three with 5,000 watts. Towers were supplied, individually or in groups of two or more, by gasoline motor-driven generators mounted on the tower skid platforms.

The 12,000-ft.-long spillway canal was a job in itself. The canal cross



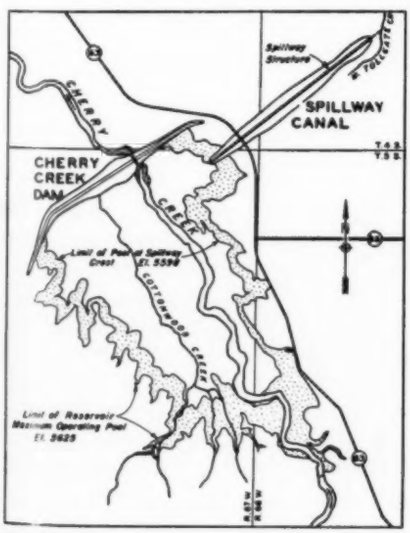
★ Left: The outlet conduit structure, with intake tower under construction in background. (See above diagram.) Note reinforced concrete collars, located at construction joints. These collars pass entirely around the 22x44 ft. box structure. Right: Bucyrus-Monighan dragline with 5-yd. Amsco bucket, at work on the 3 million yard spillway canal

section consists of a 67-ft. (bottom) wide by 85-ft. deep (max.) trapezoidal channel, from which draglines spoiled material on either side, leaving 33-ft.-wide berms. The bulk of the excavation was performed by a Bucyrus-Monighan walking dragline with 5-yd. Amsco bucket and 125-ft. boom. Considerable recasting was necessary. Despite the fact that much ripper work, drilling and shooting were necessary in the Denver formation, this part of the project progressed at the rate of 8,000 cu. yd. daily with three shifts.

Concreting Outlet Works

During the beginning stages of the dam, creek flow was to be channeled through a diversion trench located near the middle of the dam. A small diversion dam was built upstream to swing the flow to this trench. As the filling progressed, work was also pushed on the heavy concrete outlet structure. This part of the job was awarded in May, 1947, at $1,748,000 to Al Johnson Construction Co. of Minneapolis, for completion late in 1948. The structure includes three parallel conduits 710 ft. long passing through the earth dam at stream bed level in the right abutment, the openings consisting of two 8'x12' ovals and a 12-ft. diam. circular center conduit. The intake tower is 174 ft. high, with a trash rack 70 ft. high. Five 6'x9' hydraulic slide gates, including two for transitions, are provided for the three openings, which will carry a maximum discharge of 10,000 sec. ft.

Massive is the word for the concrete work here, there being over 32,000 sq. yd. of concrete and 4 million pounds of reinforcing bars used. The three openings are of integral cross section. Sealed construction joints which occur at intervals transversely are held together and further sealed by means of reinforced concrete collars (photo).


Spillway Structure
SPILLWAY CANAL
CHERRY CREEK DAM
CHERRY CREEK
Limit of Pool of Spillway Crest El. 5594
Limit of Reservoir Maximum Operating Pool El. 5629

★ Plan of Cherry Creek Dam, showing location of spillway canal in relation

★ The 30-in. toe pipe of corrugated iron, showing also detail of connection with drainage well

At the downstream end of the center conduit a hollow-jet valve will control water for irrigation. Immediately below is a stilling basin, 165 ft. long and from 53 to 100 ft. wide, heavily riprapped and containing training walls and baffles.

Excavation for the conduit trench was performed by dragline.

Concrete was made in a 50-cu.-yd.-per-hour plant which included a fully automatic Noble batching outfit with 150-ton batch hoppers, a 2,000-cu.ft. cement silo, and a 2-yd. L. C. Smith mixer. Mixing time was automatically controlled, and weights of all batch ingredients automatically recorded on a tape. This plant was located several hundred feet from the works. Concrete was delivered in 1- and 2-yd. Garbro drop buckets set in truck beds, from which they were lifted by a Northwest crane for dumping with a 90-ft. boom. An elevator was constructed to take the last concrete to parts of the intake tower too high for the crane.

Concrete quality was further controlled during summer by placing concrete during the evening shift, to capitalize the cool Colorado nights and thus offset the heat of hydration.

Soils Control and Compaction

The soils and materials organization for the Cherry Creek Dam consisted of 20 field men supported by the district office organization. The project was relatively free from soils difficulties, the chief problem being to see that proper mixing and compaction were achieved.

Before work began, complete borings and test pit sampling was made and a plan drawn up showing the character of material in various parts of the borrow areas. Subsurface sampling included open pits, machine auger and hand auger work, wash boring holes, 6-in. undisturbed samples, and drilled cores.

The semi-pervious material used for the largest part of the dam was in effect a clay-loam mixture. The mixing was largely controlled by careful routing of the elevating grader and spotting of loads from all equipment. A record was kept of the origin and placement of material from the borrow pits for future reference.

Density requirement was 98% standard AASHO, weight of compacted material ranging from 105 to 115 lb. Moisture averaged 16% to 18% optimum. Density tests were run at about every 5,000 cu. yd., there being two to three tests for each 200x1000-ft. work area, and 10 to 15 density tests per day at full production. Field densities were run with a Kanapolis hydraulic sampler, by which as many as nine tests per hour could be run. Wet weight and visual observations were the principal means, however, of keeping a practical weather eye on the progress of the rolling. Some 194 moisture-density curves were run for the various borrow areas as the basis for compaction checks.

Acknowledgments

The Wunderlich operations have been directed by George Phelps, project manager, and John New, general superintendent. The Johnson work was under Robert Englehart, project manager, and Mike Grippo, general superintendent. Cherry Creek Dam is one of the multi purpose projects in the comprehensive program for the Missouri River Basin being built by the Corps of Engineers under the direction of Maj. Gen. Lewis A. Pick, Division Engineer, Missouri River Division. The Project is in the Denver District, under immediate direction of Lt. Col. Craig Smyser, district engineer. Paul F. Jensen is resident engineer.

●

A summary was recently made of deterioration on Pennsylvania roads which are used heavily by haulers from coal strip mines. Despite load limits posted in spring, damage of $6,000,000 was found on roads, of which 92 miles were completely destroyed and 324 miles partially destroyed. *(Highway Builder).*

●

The New Jersey State Highway Department painted six and one-half million lineal feet of traffic stripes during 1948, according to the report.

EDITORIAL

★ Road Maintenance and Repairs by Contract

One of the most vigorous pieces of thinking to come out of the recent AGC meeting in New York, as far as highway work is concerned, is the idea that more of the nation's huge highway maintenance and repair program ought best to be performed by private contract.

Nation-wide spotlighting of this matter is long overdue. For decades we've all lived in a split-personality world of thinking on maintenance. In effect, highway officials have said "Sure, we let new road projects to the lowest bidder? Of course! That's the way to get the benefit of competition, and, besides, this is the good old U.S.A. where citizens, not the government, do the enterprising." But these same officials in many states and counties have allowed their force account and their maintenance and repair work to grow and encompass many heavy tasks far removed from the routine world of the maintenance patrolman.

Not Always Interested

Contractors haven't always shown the keen interest in maintenance work that they suddenly are evincing today, and it's partly their fault that some highway departments have taken over so completely. The departments in many instances have literally had to do so, in order to get the job done at fair prices and according to seasonal plan.

But now there's a noticeable slacking off of some kinds of construction, and also an awakening to the fact that road work will consist more and more of maintenance as the highway system becomes completed and stabilized. Contractors have suddenly realized that here is a billion-dollar-a-year business they ought to be "in on" more heavily.

Thousands of miles of heavy repairs, such as resurfacing, mudjacking and undersealing, wholesale joint cleaning and re-sealing, deep patching, surface treatment, shoulder widening, reshaping, and bridge fixing, are on the dockets and if it makes sense to contract new projects it certainly makes just as much sense to let this work to private contract.

Maintenance by contract isn't a new idea. But it is still so little tried that fanning the idea alive, as was done at the Waldorf last month, presages some serious adjustments. And it calls for openmindedness and experimentation, with courage and with the high purpose on both sides of seeing just what kinds of work contractors can do well and efficiently.

Contractors can surely contribute new field procedures, although they'll have to hump to beat the best of our department maintenance engineers. Out in Iowa we hear that contractors wanted 25 to 35 cents a foot for concrete lip curb removal, extensively planned, whereupon state forces devised a machine which did the job for a fraction.

Long Range Matter

The administrative thinking here, as with all other phases of highway work, has to be long range nowadays for best results. When a highway department streamlines its staff and gears to letting its repairs, it will have to plan seasonal tasks and yearly programs so as to give contractors as steady work as possible. On the other hand, when a state contractor association pleads for a larger slice of such work, its members had better figure on sticking to the field, once they get going, come juicy construction job opportunities or not, since road maintenance, like the postal service, is part of a continuing public service.

★ Case for Contract System Well Stated

Recommending that the nation spend $60,000,000,000 over a 20-year period to overhaul our highways, Charles M. Upham in a recent address before a business group explained why highway work should be done by "the contract system—the American way of doing business."

Contract construction of all kinds exerts a maximum leverage or multiplying effect on the nation's economy, he noted. For every investment of $100,000,000 in highway contracts, business worth $315,000,000 immediately results in outlays for such items as materials, equipment, labor and services by the contractors and supporting industries. Contract construction is free enterprise at its best. Force account work is not only uneconomical, but is contrary to the basic concepts of free enterprise because it eliminates competition.

Highway contractors are today at the peak of their efficiency because they use skilled engineers to compute costs and plans before submitting bids. Only contractors on a selected list provided by surety companies are awarded highway contracts, since all states require bonding of highway contractors. The check surety companies make of contractors' financial and physical ability to carry out a job indicates the great part that the surety companies, as well as contractors, are playing in the nation's highway construction program.

★ Maine Turnpike Needed a Raise

After a mild winter, in which traffic should have helped add up to an exceptionally good first year of operation, the Maine Turnpike Authority has come up with a deficit and has been forced to raise its toll.

This fact should cause state legislators to stop and think. Toll road propositions are under consideration in Ohio and several other states. It is a serious question as to whether the public is willing to pay the equivalent of 15 or 20c a gallon tax, such as is required in the form of toll, for the privilege of driving over deluxe facilities. And even this toll may not be enough. We must all remember that the Pennsylvania Turnpike started with a big RFC lift, and that it had exceptional circumstances in favor of its construction. Although we will be mighty glad to see our advertisers sell machinery and materials to build any toll roads, we think that eventually the American public will be sorry when many toll gates confront them as they travel about over this otherwise gateless highway system of ours. The evangelism used in promoting toll projects would be better spent getting more funds for long-range, statewide highway development.

★ CCA Says "Make up Mind" on Pavement Type

The Civil Aeronautics Administration is performing a service in its present effort to eliminate alternate bids on airport paving. According to director of airports Phillip Moore this agency is doing everything possible to get sponsors or owners to make up their minds on the kind of pavement wanted on a basis other than bid price. Only two out of sixty pavement projects submitted so far this year have alternate designs.

This certainly makes sense, and will make for better airfield service. In the year 2049 AD engineers will still be wrangling over the respective merits of various pavement types, and no doubt there still will be prejudiced engineers who can't see one type or another for dust. Engineers today, who are called on to design an airport, should certainly be able to arrive at the most feasible design for given conditions of material-availability, subgrade, climate and traffic. The engineer, not the bidder, should decide the type of pavement.

★ Haul Road Maintenance on your Safety Program?

We are indebted to one of our contractor association acquaintances for the suggestion that a good way to plan accident prevention on the job is to build the safety program around good maintenance of equipment and good job conditions, with particular attention to haul roads. Earthmoving equipment especially has been geared up these days until the machines move plenty fast. Many an accident is due to machines getting out of control and turning over or running into something or somebody.

This seems like good thinking. But more important than how to plan a safety program among construction workers is the question of whether to have a program at all. Many road contractors are still not sold enough on the safety idea to put real front-office authority behind it. They think of safety as a problem chiefly concentrated in the structural steel and building field, rather than "down on the ground." And, as one cynic put it, as long as jobs are booming and profits easy, and insurance coverage available, why waste time on the fine points of safety training.

The reason for cynics and all others, as told to AGC contractor members in New York recently, is very simple: *a safety program pays $$.*

★ Can Contractors Do it Cheaper?

Always we keep raising this question.

In this issue of R & S again is an article telling how a state highway department staff found that modern mobile aggregate producing equipment could save substantial sums on graveling work, compared to purchases of all material from commercial plants involving long hauls.

This kind of initiative, in which a cost saving is achieved in behalf of the taxpayer, is a fine example of public service. As we ponder this article, however, we wonder if there isn't enough steady work in progress over the state to encourage private contractors to enter the field of pit-to-pit gravel production and delivery f.o.b. stockpile or tailgate spreading.

The contractor picture is likely to be different from here on, with more spirited competition than during the past few years. When private bidders can approximate the costs achieved by publicly owned equipment, highway officials as good Americans ought to give them a chance. If a state's work is planned to give private bidders a reasonable outlook for a steady succession of jobs, and a wholehearted effort made to stir up interest among contractors in tackling this work, still lower costs might be obtained. We aren't familiar enough with the Maine situation to guess the outcome in advance. Maybe state-owned equipment is the best answer for the moment. But there's a good principle involved here.

★ How the contractor's three asphalt plants were laid out in relation to stockpile areas and haul roads.

Asphaltic Surfacing Details at Baltimore Airport

By B. E. Beavin

Project Manager, Whitman-Requardt-Greiner Co., Consulting Engineers, Baltimore, Md.

Contractor produced 367,000 tons of asphaltic concrete, mixed and placed at an average rate of 11,860 tons per week. Notes on how it was done with three plants and three finishers

BALTIMORE'S new Friendship International Airport first came into the engineering spotlight as the scene of the first systematic use of super-compaction equipment on sandy fill and subgrade material [R&S Dec. '47]. Of equal interest in many respects is the rapidity and control achieved in the placement of asphaltic concrete for some 700,000 sq. yd. of pavement area. This work, which took place between May 10 and November 11, 1938, involved the production and placement of 367,658 tons of hot-mixed asphaltic concrete.

This achievement was a result of steady production with three plants. The production rate was the equivalent of 11,860 tons per week, with each plant averaging 901 tons per days of actual operation. Hourly rates ranged from 66 to 84 tons per plant. A better visualization of this huge tonnage is gained by realizing that it is equivalent to that required to place a 3-in. surface 18 ft. wide over a distance of 210 miles.

Some Performance Details

Plant employed had rated capacities as follows: No. 1, 60 to 75 tons per hour; No. 2, 80 to 120 tons; No. 3, 90 to 100 tons. Interestingly enough, the plants performed at almost identical rates, averaging 77 tons per hour, and the time each was operated varied only as much as eight days.

Plant No. 2 turned out 120,215 tons in 132 days. Plant No. 3—which operated 140 days—produced 137,081 tons. However, plant No. 3 was in commission for a slightly shorter time than the other two plants, albeit it produced a slightly larger number of tons of asphalt mixtures. Plant No. 1 produced slightly more than 103,000 tons. Plant No. 2 turned out 127,000 tons; and Plant No. 3 produced 137,000 tons.

The pavement was placed in four layers of two of 3½" and two of 1½" each. The asphalt content in each of the two bottom layers averaged about 5½% by weight. The balance of the mixture in the two lower layers was composed of well-graded on-the-site sand and gravel, 100% of which passed the 1-in. screen. The grading was almost ideal. 85-100 penetration asphalt was used in the two lower courses, and 100-120 penetration asphalt in the binder and surface courses on the runways.

Delivery of asphalt cement from one of the Baltimore refineries was accomplished by means of two 4,000-gal. tank trailers. The average over-the-road haul was 30 miles, and each truck made an average of 5 trips a day.

Specifications called for the mixing of aggregates and the asphalt for a period of at least 45 seconds. The asphalt was heated to 275° F. and the aggregates were heated to 300° F. Grading of the aggregates was controlled in such a manner as to assure highly satisfactory stability tests, using the Marshall Stableometer.

One naturally would think that a large fleet of trucks would have been required for such a large tonnage. However, since the plants were set up at the site, and the average haul involved was only 1 mile, our contractors got along nicely with a maximum of 12 trucks. They used four rollers, but not all were needed continuously. Likewise, the three mechanical spreaders on the job were not used full-time.

White Chip Cover

In addition to the four layers of hot-mixed, plant-produced asphalt materials, our Friendship International Airport has been seal coated with an application of liquid asphalt, and a white aggregate, whereby the runways and other areas are visible from great distances. The aggregate used in the seal coating operations did not exceed ⅜-in. particle size.

I wish to take this opportunity to comment on the splendid cooperation we received from the contractors in all phases of producing and placing asphalt materials. The American Asphalt Products Company of Washington, D.C., and the Bituminous Construction Company of Baltimore, pooled their equipment for this job under the field direction of A. R. Baker and E. Stewart Mitchell. Friendship International Airport is a project of the Baltimore Aviation Commission, Major General Donald Connolly who was formerly administrator of the Civil Aeronautics Administration being the director.

●

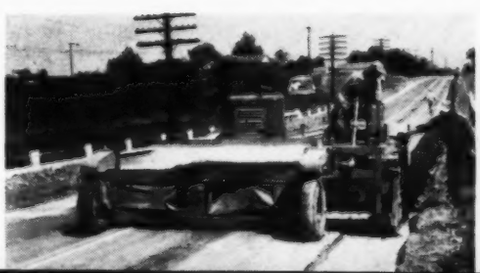
As a means of glare protection the New Jersey state highway department is planting 94 Japanese holly units in center island along a section of Route 25 artery through Elizabeth.

★ One of the hot-mix plants at Baltimore Airport (Barber-Greene)

★ Finishing was expedited by use of large capacity dump trucks (Autocar shown here)

Step-by-Step on Ohio Widening Job

Project: Ohio department of highways, U.S. 30-S west of Mansfield; autumn, 1948. **Contractor:** Mansfield Asphalt Paving Co. **Improvement:** Widen 2 ft. each side by placing two 4-in. crushed stone layers with 4-in. max. stone, followed by 3-in. layer of hot-mixed asphaltic concrete. Stone placed 30 in. wide. **Upper Scenes:** Widener (All Purpose Apsco Model 60) laying stone. **Lower Scenes:** Same equipment placing hot-mix. **Comment:** Traffic maintained. Change-over from one side of road to other took about half-minute. Whole operation speeded by modern equipment such as this, which has largely supplanted contractor-built rigs formerly improvised for widening work. Trenching and rolling equipment not shown.



Using Contractors' Equipment for Winter Maintenance

By C. L. Motl
Maintenance Engineer, Minnesota Department of Highways, St. Paul

LIKE all states in the winter belt, Minnesota each year faces a season of about four months' duration in which traffic on its roads may be seriously hampered by slippery surfaces.

When this condition develops, traffic is slowed down to less than one-half of normal speeds, and in extreme cases it may have difficulty in moving at all.

Dry Road Safest

Applying abrasives or chemicals to improve traction is at best only a partial cure, since extensive tests have disclosed that less than half of the hazard condition is overcome by surface treatment of the ice.

In the final analysis, it appears that the only way to cure an ice condition is to operate on it and remove it from the roadway. In other words, the only safe road in winter is a dry road. To one experienced in the operations involved in the removal of ice and/or compacted snow from travelled roadways, it is at once obvious that this is no small matter, either as an operation or as an expenditure of funds. The problem is further complicated by the uncertainty of the extent of work involved from year to year. One winter there may be very little icing, while the next winter the icing may be almost continuous because of frequent repetition of storms that cause it.

Setting up an organization of personnel and equipment to cope satisfactorily with a widely fluctuating problem such as winter icing, is therefore, something that requires careful consideration.

When Minnesota started out to consider ice removal, a quick study and preview of the essential requirements needed in the way of men and equipment soon revealed that to begin with the Highway Department with its regular forces could handle only a limited mileage of the 11,000 mile Trunk System, and work would, therefore, need to be limited to those mileages that carried the heaviest and most important traffic.

After trying out various types of equipment for ice removal, it developed that for the wide variety of ice and compacted snow types encountered, the motor grader seemed to be the most proficient all-around unit to use. This was especially true with the powerful and heavy machines capable of working at fast speeds and transporting themselves from place to place quickly.

The bare or dry roads produced by the initial blading operations generated demands for more miles of the same, and the next question was "how to expand our organization without loading up with a lot of seasonal equipment and personnel."

Knowing that the numerous road contractors throughout the state owned a large number of motor graders that usually stood idle during the winter, it was thought advisable to try some plan of utilizing this idle equipment on a "as and when needed" basis. In order to comply with our legal requirements, bids for winter motor grader rental were advertised for and proposals sent to all contractors interested. We've done this during the early fall for the past seven years. At first only a few responded, but as our program and requirements became better known, more bids came in, until now we have over 160 motor graders listed by 100 owners, available for use. Fortunately they are well distributed, so that good coverage is available in most areas on short notice.

Briefly, the State requirements are that the contractor give in his bid the model and make of machine he proposes to use and his rental rate per hour. This includes fuel, oil, operator and all other operating expenses except cutting edges, scarifier tips, and cross-chains for tire chains, which are furnished by the State.

The bidder is not required to go to work unless he desires to do so at the time he is called, and the State guarantees no work unless conditions demand it. If several acceptable bidders are located at one town or point, they are called out in the order of their bids—low bidder being called first.

Why OK With Contractors

Contractors do not object to the seasonal character of the work, because they usually operate out of their winter headquarters and use their men who are employed during the winter on other work.

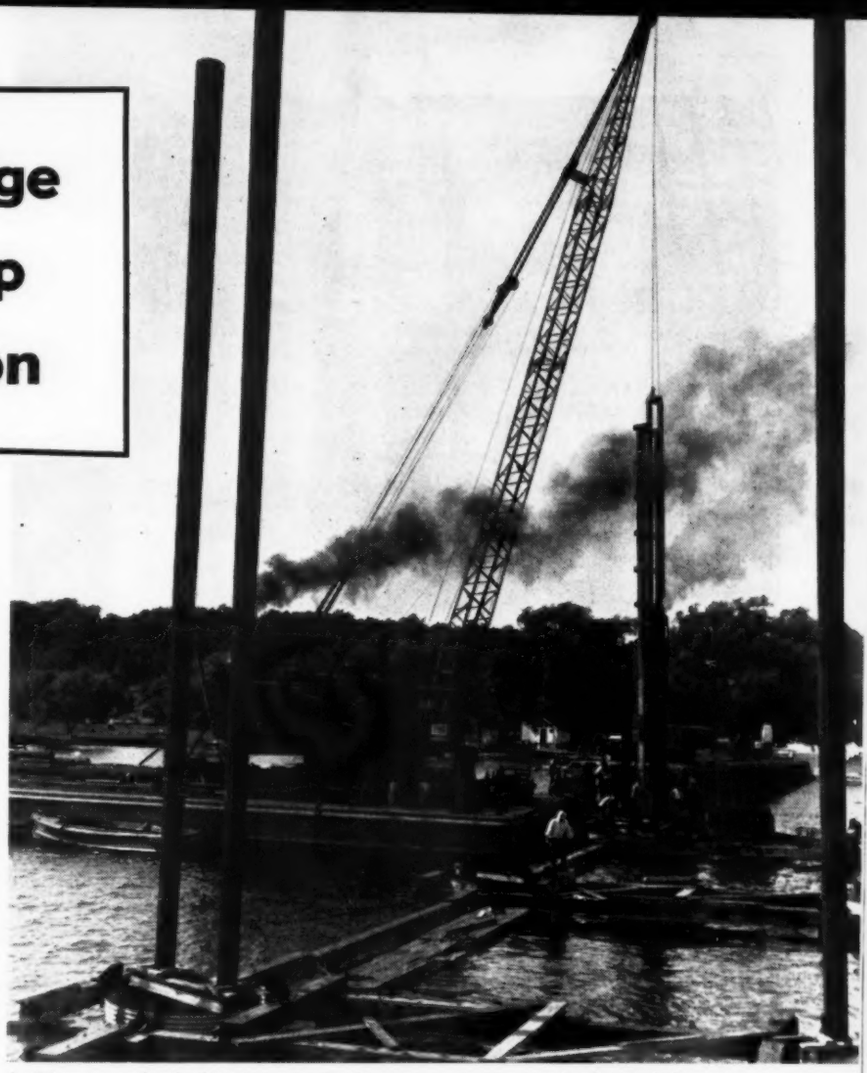
The plan of using contractor winter-idle motor graders has worked out so well that it may be expanded to use other types of machines such as belt-type and front-end loaders to load snow in small cities and villages. It is possible that some of the large power scrapers could be used for loading up and disposing of snow if some practical means could be found to roll and compact the snow before loading the scraper. Compacted snow would handle easier and would increase the capacity of the scraper ten-fold in terms of loose snow measurement.

There is a useful job to be done by contractors' winter-idle equipment in the snow removal and ice control programs, but it will need the promotional energy and thinking of the contractors to develop it. Unless contractors get into the winter program with their equipment, the governmental units will buy their own, and this may lead to its utilization on summer work which should be done by contract.

★ Each circular or square spot tells location of one or more contractor-owned motor graders available for ice removal work on a contract rental-rate basis. Map complete as of Nov. 1, 1948

Secondary Bridge Requires Deep Pile Foundation

8,100 lin. ft. of tapered steel shell piles of 105-ft. maximum length employed under cellular-type piers for secondary federal-aid bridge in Michigan. Two scows with cranes permitted continuous pile driving and concreting operations



★ Piles were plumbed with a transit. Leaning appearance of piles at left due to distortion in photo

By C. H. Voss

Bridge Office Engineer
Michigan State Highway Department, Lansing

WHILE economy considerations are an especial need for secondary highway projects, some bridges must be provided on our secondary system at sites which require considerable expense. This was the case at Pettys Bayou, just north of Spring Lake Village, Ottawa County, Michigan. Here the county has just completed a federal-aid secondary highway bridge under state highway department supervision. This article presents details of what is considered to be a low-cost solution, considering the unsatisfactory foundation conditions.

The bridge as constructed during 1948 consists of 417 lineal feet of two-lane concrete paved deck, supported by two cellular-type abutments and eight caisson-type piers. The structure consists of two spans at 53 ft., five spans at 55 ft. and two spans at 18 ft. There is a 24-ft. roadway, two 5-ft. concrete sidewalks, steel handrails with concrete posts. The cost was $237,000, including an extra item for steel sheet piling left in place around abutments. The contractors were L. W. Lamb, of Holland, Mich., and Luedtke Engineering Co., of Frankfort, Mich.

The design was dictated by the type of material underlying the lake bottom which provided very low bearing values at depths of over 100 ft. below the water surface. Soil borings made during the survey indicated acquatic peat, silty gray and yellow sand, and plastic blue clay. The water depth is 18 ft. at the center of the span, and in order to provide satisfactory bearing for the foundation units, the substructure was designed to incorporate the use of friction piling which was provided by the use of tapered, fluted shell piles in the pier units and timber piles in the abutment units.

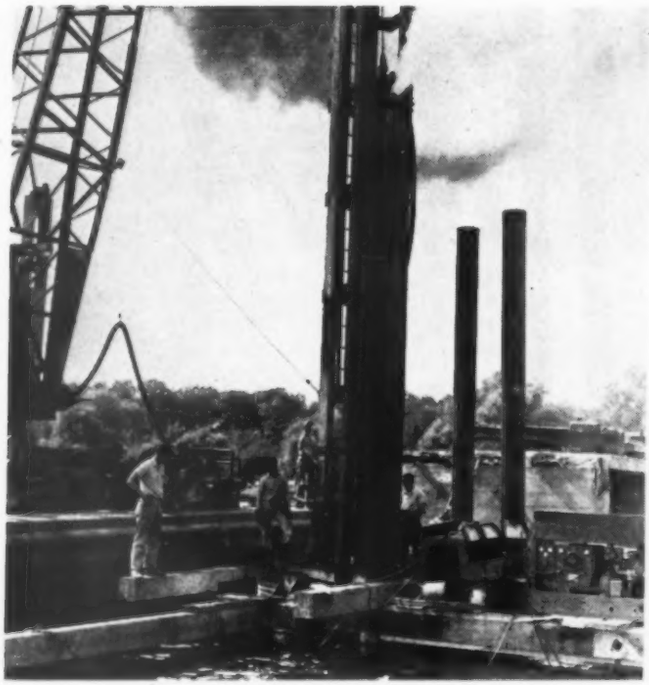
The abutment units are of cellular construction supported on timber piling. This type of construction was selected to reduce the weight on the underlying soil and to spread the bearing over a greater area so as to avoid superimposing loads on the approach fill. The front row of piling was battered to resist longitudinal movement.

The piers were each constructed of two 8-ft. diam., 8-ga. corrugated metal caissons which were placed squarely on the leveled lake bottom, after which the shell piles were driven through openings left in the bottom of the caisson shells. It was originally intended to provide for 16-in. fluted tapered foundation piling, but as the contractor was unable to obtain this diameter piling, 18-in. piling were used. These piling were No. 7 gauge Union Metal piles, with a continuous taper. Six holes were placed in the bottom of each metal caisson through which the piling were driven.

Construction Procedure

The first operation was to construct the approach fills of sand. The original intention was to build the fill slope 3:1 in front of the abutments, but the final fill slopes took a natural angle of repose of about 4:1.

After the approach fills were completed, steel sheet piling was driven around the abutment outline, and excavation completed to the bottom of the seal. Timber piles were then driven to 20 tons bearing. The north abutment required piles about 25 ft. in length and 20 to 30 tons of bearing were ob-



★ Piles were driven in pairs opposite each other, to equalize pile friction and possible tendency for caisson to shift

★ View of the concrete plant and floating crane equipment employed to place concrete

tained. The South abutment required 25 to 30 ft. piling, and bearings ranged from 20 to 29 tons. About 2,500 lineal feet of piling were driven for these two units.

After the abutment units were completed, all of the steel sheet piling was removed except along the front face, and for a distance of 10 feet back on each wing. This sheet piling, 20 ft. in length, was left in place to protect the substructure units from any possible undermining due to wave action.

Before the pier caissons were placed on the lake bottom, timber piles were driven and a falsework was constructed of 12x12 timbers attached to the timber piles which would permit the placing of the steel caissons inside the frame work, and in their exact location in the substructure.

The concrete mixer was placed on the south approach, and pier falsework was constructed for piers 4, 5 and 6. This falsework and the concreting operations on the pier units was handled by a steam crane operating from a scow. Pier 6 was the first pier placed, although operations on pierce 5 and 4 were continued simultaneously.

After the pier caissons were firmly settled on the lake bottom and the bottom leveled, the steel shell piles were driven through the caisson's bottom openings. For pier 6, piles were driven an average of 55 ft. below cutoff level (6 ft. below high-water line); 45 tons bearing obtained. For pier No. 5, to 90 ft. maximum depth below cutoff; 40 tons or better obtained. For pier No. 4, piles were driven 105 ft. below cutoff; 40 tons or better obtained. The original pile length was 75 ft., and 20-ft. extensions were provided to permit driving to the full bearing, and still keep the upper end of the tubes above the water surface.

Sealing Details

A tremie seal 4 ft. in depth was then poured in the bottom of the caissons. It was necessary to have a diver place a 3-to-1 concrete mortar in sacks around the holes, after which the tremie seals were poured without leakage. After sealing, the caissons were de-watered, the tubular piles cut off at final elevation, and the piles filled with concrete.

A pour of Grade "X" concrete containing 0.75 bbl. cement per cu. yd. was then made in each caisson for a depth of 6 to 8 ft., depending on the caisson height. A 6-ft. concrete cap was next placed to an elevation of 4 ft. below the water surface, and 2 ft. over the tops of the piles. An octagonal pour was then made in each caisson which brought the top of the octagonal cap to final height of about 3 ft. above high-water elevation.

A removable section of the 8-ft.-diam. corrugated metal caisson was removed, leaving the top of the perma-

Notes on Pile Driving

A diver was used to guide the tip of the piles through the holes in the caisson bottom and a template was made to guide them at the top of the caisson. Piles were plumbed longitudinally with a transit and laterally with a carpenter's level. In this manner, it was possible to keep even the 120-ft. piles within 8 to 10 in. of being plumb.

A McKiernan-Terry 10-B-3 steam hammer was used in driving all piles. Bearing tests were made on a series of 50 blows according to the Engineering-News Record formula (A little more conservative than the Michigan highway formula).

Piles were driven in pairs opposite each other. This was done to prevent shifting of the caissons due to friction between piles and caisson.

In general, the test borings gave a fairly good indication of what length pile would be required. However, this was not always true. In one case, a pile driven less than three feet from another was 32.5 ft. shorter and the shorter pile had by far the greater bearing value.

We also learned that piles which were allowed to set overnight (while an extension was being welded on) would "fetch up" as much as 10 to 20 tons more. In fact, a test on the first foot would sometimes stand up to the 40-ton bearing required, but after the skin friction was broken it might drop to as low as 25-ton bearing.

Piles were inspected for leaks after driving, using an electric bulb and 200 foot extension cord.

First piles were driven on Aug. 4, and the last on Sept. 18. Average length of piles was 84.9 ft. below cut-off.

nent caisson steel well below the water surface.

A reinforced concrete tie beam was then cast connecting the caissons in each pier. It should be noted that the two short spans between piers 4A and 4B and piers 3A and 3B are further reinforced for stability by a longitudinal concrete beam connecting these piers, making four-caisson tower pier units of piers 3 and 4. Spans 3A-3B and 4A-4B are each 18 ft.

Falsework Re-used

The new bridge was placed parallel to an old concrete structure in this location, and half of the old bridge was removed to permit construction of piers 4 through 6. The second half was removed prior to placing of the falsework framing for the caissons in piers 1, 2 and 3. As piers 4, 5 and 6 were completed, the falsework framing was removed and transferred to the south half of the structure and placed in position to receive the caisson for piers 1, 2 and 3.

While work on piers 1, 2 and 3, was under way, structural steel was placed for spans 9, 8, 7 and 6, the superstructure forming placed, and the deck slab and sidewalk concreting completed. This sequence of operation, plus use of two cranes on scows, permitted continuous use of the contractor's scows in driving piles and placing pier and superstructure concrete.

The same method of construction was continued for piers 1, 2 and 3. The length of tubular piling for piers 3 and 2 averaged 100 ft., and for pier No. 1 about 75 ft. in length.

The mixer was placed on the approach fill, back of the south abutment for the south half of the structure, then transferred to the north abutment. Broken concrete from the original structure was placed on the river banks as riprap.

Pier piling were driven with a double-acting steam hammer; abutment piling, with a drop hammer.

Work on this project started Feb. 11, 1948. Approach fills and abutment units were completed about July 1, and work was then suspended for about two weeks, except for clean-up work and form building, pending arrival of the contractor's marine equipment. Work was then resumed and the final concrete pour was made on Nov. 10. The structure was opened to local traffic Dec. 3, 1948.

Thomas C. Fullerton was project engineer. George M. Foster is bridge engineer of the Michigan state highway department, Charles M. Ziegler commissioner.

★ Setting beams. Note cross bracing and other details of the mid-channel double-bent pier

Structure Quantities

Timber Piles—Furnished and Driven, 2,500 lin. ft.
Cast in Place Concrete Piles—Furnished and Driven, 8,151 lin. ft.
8-ft. Diam. Corrugated Metal Pipe Caissons, 262 lin. ft.
Caisson Structural Steel—Fabrication and Erection, 11,638 lb.
Tremie Concrete, 89.6 cy. yd.
Grade "X" Concrete, 142.8 cu. yd.
Grade "B" Concrete Substructure, 829.4 cu. yd.
Cement, 2,050 bbl.
Steel Reinforcement, 155,890 lb.
Structural Steel—Fabrication and Erection, 465,995 lb.
Bridge Railing, 834 lin. ft.
Rubber Surface Finish, 10,767 sq. ft.

Approaches

Removing Old Pavement, 1170 sq. yd.
Borrow Excavation, 12,500 cu. yd.
Trimming and Furnishing Earth Grade, 9.3 Sta.
Fine Grading and Cleanup, 9.3 Sta.
Concrete Pavement 8-inch Uniform, 2,290 sq. yd.
Pavement Reinforcement, 2,290 sq. yd.
2 Cable Guard Rail, 670 lin. ft.
Class B Sodding, 970 sq. yd.

Maine Turnpike Ups Tolls

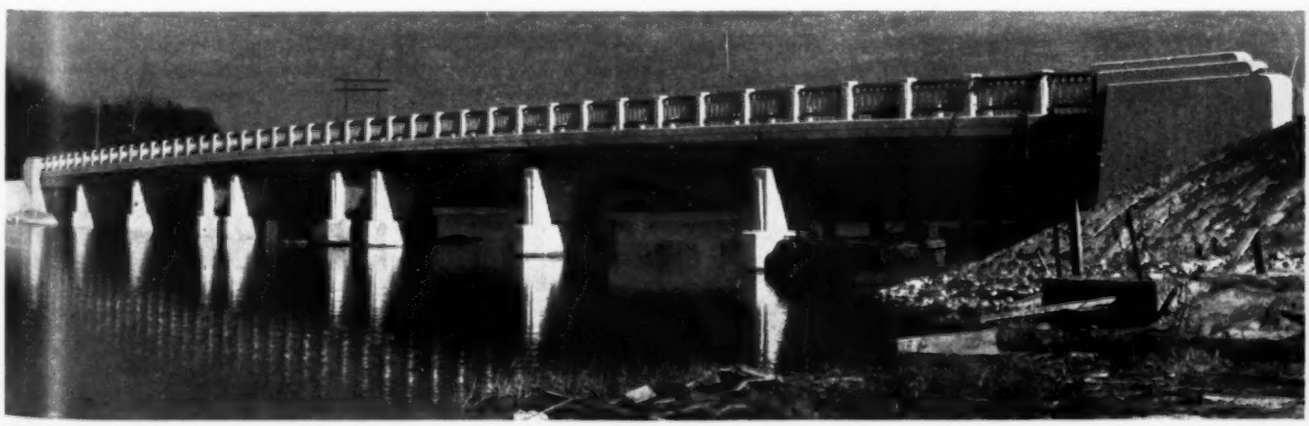
The Maine Turnpike officials have announced plans to raise toll charges on both passenger and commercial vehicles. The announcement followed publication of the financial report for its first year of operation. The report showed that had the Turnpike had to pay interest on its bonds from its revenues the first year, a deficit of some $75,000 would have been incurred.

This record was made despite the fact that the winter has been unusually mild in Maine and consequently maintenance costs were lower than normally would be expected.

The Maine road's interest on its bonds was capitalized (paid out of capital) for its first year of operation, but otherwise would have required $537,296 to meet. The road's other expenses totalled $225,662. Together, these add up to $762,958. The road took in $687,946.

Tolls for the 47-mile road will be increased May 1 from 50 to 60 cents for passenger cars and by 5 to 25 cents for commercial vehicles.

For passenger cars traveling 15 miles on a gallon of gas, the new tolls will be equivalent to an increase in gasoline tax from 15.6 cents a gallon to 19.2 cents a gallon. Motorists also pay regular state gasoline taxes.



★ The completed bridge—a model of attractive yet simple design

★ AGC officers: H. E. Foreman, Washington, D. C., Managing Director; Adolph Teichert, Jr., A. Teichert & Son, Inc., Sacramento, Calif., newly elected president; Dwight W. Winkelman, D. W. Winkelman Co., Syracuse, N. Y., 1948 president; and Walter L. Couse, Walter L. Couse & Co., Detroit, Mich., newly elected vice president. Missing from the picture is William Muirhead, William Muirhead Construction Co., Durham, N. C., secretary-treasurer.

★ R. E. Dougherty, New York, past-president ASCE, who addressed the convention on the relations of contractors and engineers; Thomas H. MacDonald, commissioner of PRA, Washington, D. C., who reviewed the current highway program; and George C. Koss, Koss Construction Co., Des Moines, Iowa, 1948 chairman of the AGC highway contractors' division.

AGC Members Eye Road Maintenance

Delegates at record-breaking 30th annual convention reminded they should look increasingly to highway maintenance work for contract jobs as expenditures in this field mount

WITH highway maintenance grown to a 1¼ billion dollar annual business, and likely some day to surpass new construction in volume, road contractors must look more and more to the repair and upkeep field as a source of business.

This fact was one of many brought out at the 30th anniversary convention of the Associated General Contractors of America, Inc., held Feb. 28 through March 3, at the Waldorf-Astoria in New York. Over a thousand delegates attended the sessions of AGC, whose membership now numbers more than 5,000 prime contractors in 105 chapter or affiliated local groups.

A. Teichert Jr. of Sacramento, Calif., was elected president of AGC for 1949, succeeding D. W. Winkelman of Syracuse, N. Y.

★ 1949 officers, AGC highway contractors' division: N. K. Dickerson, Jr., Monroe, N. C., vice chairman, and Carl E. Nelson, Logan, Utah, chairman. Mr. Nelson succeeded George C. Koss, Des Moines, Iowa.

Broad Industry Program

The AGC program, said to be the broadest of any U.S. industry group's, is spearheaded by a vigorous stand in behalf of private enterprise. Facts that should make not only contractors but also engineers and public officials ponder the nation's future were brought out by such outstanding speakers as Carrol M. Shanks, president, Prudential Insurance Co. He observed that business and prosperity levels go up or down with the volume of capital investment, which means construction of all kinds. He urged government policies that will encourage business men to invest confidently in new plants and equipment, saying that 55 billions in such investments are waiting to be made in the next five years if the financing is available, but high taxes threaten to siphon off investment capital.

Retiring president Winkelman in his address said that trends in government controls and government bigness make it necessary for contractors to be strongly organized to protect their rights as businessmen. He spoke with pride on the contracting industry's record of $49 billions in war construction, and its ability to tackle big programs to come.

Managing director Harold E. Foreman, making his annual report, characterized the Association as "frontline representatives of free enterprise." He predicted an 18½ billion dollar construction volume and $6 billion for maintenance and repair operations in 1949, despite present slacking off of private construction. Costs reached a peak in the last quarter of 1948, he said, and have tended to stabilize since. Mr. Foreman also reported that deliveries of most types of equipment are now good; that fewer shortages of skilled workers are being reported today, with increased productivity of labor frequently observed; that more competition is being reported for most construction projects.

The AGC took positive steps to help reduce construction costs during 1948, in the form of cooperative committee action with highway and aviation officials (through AASHO and NASAO), the engineering profession (through ASCE), and with architects (through AIA). Expansion of this cooperative committee activity is hailed as a major forward step in organized contracting, objectives of which will be to result in improved specifications; new field procedures to take better advantage of improved machinery; clearer bidding, awarding and administrative procedures; and better relationships generally aimed at lower opertaing costs for contractors.

New CAA Regulations

The AGC highway division, meeting under chairman George C. Koss of Iowa, heard CAA director of airports Phillip Moore of Washington, D. C., tell of the federal airport program. Since May, 1946, Congress has appropriated $106 millions, now allotted to 1,000 projects. About 640 projects were under contract as of Feb. 23 this year, totaling $67 millions in federal funds. Contracts have been completed on 215 projects.

Stating that CAA administrator Delos W. Rentzel believed in simplification and results, this speaker told of progress in cutting federal red tape, and streamlining regulations. Answering long and loud complaints as to the slowness of payment on CAA projects, Mr. Moore said that contractors are now given final payments without waiting for Washington approval, thus saving three weeks. However, he took contractors to task for failing to submit final estimates promptly and other delays more their fault than CAA's.

Highway Contractor Group

Highlights of the past year's work of the AGC Highway Contractor Division were given by A. N. Carter, division manager. Saying that $22 *billion* expenditure on highway betterment is needed immediately, he urged a major increase in the rate of construction on the nation's highways.

Better long-range planning, more public education on highway needs, and an enlarged federal participation are among the needs, said Carter, who particularly urged that the highway departments make maximum use of contract methods on maintenance as well as construction. Road maintenance today is nearly as large an enterprise as new road construction, he reminded, and may equal or surpass construction soon. Contractors who do road work must turn increasingly to maintenance and repair work for jobs.

In noting that the state highway departments put $1.25 billion in new road projects under construction in 1948, and will probably raise this figure to $1.4 billion this year, Mr. Carter also pointed out that as of Jan. 1, 1949, over $470 millions in federal funds were "unprogrammed." Furthermore, over $657 millions in projects (total cost) are merely "programmed," and another $338 million's worth of jobs in the "plans approved but work not started" phase. These figures exceed the $808 million of federal aid jobs actually under construction as of Jan. 1 this year.

Among the items of progress noted by manager Carter during 1948 to expedite roadbuilding was the easing of PRA restrictions on sub-contracting, to allow up to 50% of the project "subbed"; simplification of payroll reporting on federal-aid projects; discussion of general contract provisions, which will result in a recommendation to AASHO; a survey of state practices in publishing estimates in advance of lettings; the increase to 21 of states now constitutionally forbidding diversion of road funds to non-road use; and trends toward increased highway revenues among the states.

Most serious obstacle to highway progress, believes Carter, is the continued grave shortage in highway department technical personnel. This shortage, which numbers at least 12,000, is due to low salary scales and lack of other career inducements.

During recent months new AGC highway and heavy contractor chapters have been formed in Maryland, Louisiana and Michigan.

Bid Price Peak?

Future bid prices will depend largely on union labor wage increase demands, Mr. Carter predicted. Competition for jobs meanwhile has tended to soften prices in some states. As noted in the accompanying chart, road

YEAR	COMMON EXCAVATION		CONCRETE PAVEMENT		STRUCTURES BID PRICE				COMPOSITE MILE INDEX
	Bid Price Cu. Yd.	Sub-Index	Bid Price Sq. Yd	Sub-Index	Rein-Forcing Steel-Lb.	Structural Steel Lb.	Structural Concrete Cu. Yd	Sub-Index	
1946									
1st Qtr.	.37	105.4	2.66	119.9	.067	.105	35.44	150.1	119.3
2nd Qtr.	.34	96.9	2.63	118.6	.072	.115	37.01	158.8	117.0
3rd Qtr.	.35	99.7	2.75	124.0	.076	.115	39.83	168.6	122.1
4th Qtr.	.37	105.4	3.08	138.8	.083	.118	42.86	181.2	133.3
Average	.36	101.9	2.78	125.3	.075	.113	38.79	164.7	122.9
1947									
1st Qtr.	.38	108.3	3.01	135.7	.088	.134	43.35	188.1	133.9
2nd Qtr.	.38	108.3	3.14	141.6	.092	.126	46.14	196.5	138.0
3rd Qtr.	40	114.0	3.26	147.0	.093	.128	46.14	197.5	142.9
4th Qtr.	.40	114.0	3.38	152.4	.097	.138	47.71	205.6	146.7
Average	.39	111.2	3.20	144.2	.093	.132	45.84	196.9	140.4
1948									
1st Qtr.	.43	122.5	3.34	150.6	.100	.145	50.46	215.7	150.5
2nd Qtr.	.43	122.5	3.56	160.5	.106	.158	49.74	219.7	155.9
3rd Qtr.	.44	125.4	3.71	167.3	.109	.159	50.89	224.6	161.0
4th Qtr.	.42	119.7	3.92	176.7	.116	.169	52.89	235.7	165.3
Average	.43	122.5	3.63	163.8	.108	.158	51.00	223.9	158.2

★ Base for composite mile, 1925-29, involves 17,491 cu. yd. of excavation, 3,726 sq. yd. of paving, 16,000 lb. reinforcing steel, 4,325 lb. structural steel and 68 cu. yd. of structural concrete.

New AGC Leaders

President: Adolph Teichert, Jr., president, A. Teichert & Son, Inc., contractors of Sacramento, Calif. succeeds Dwight W. Winkelman, president, D. W. Winkelman Co., Syracuse (N.Y.) contractor.

Vice President: Walter L. Couse of Walter L. Couse & Co., Detroit, Mich.

New Directors: J. W. Brennan, Brennan & Cahoon, Inc., Pocatello, Ida.; J. G. Bartholomew, J. G. Bartholomew Co., Dallas, Tex.; Chester W. Cunningham, Condon-Cunningham Co., Omaha, Neb.; Cecil D. Bartholow, W. E. Bartholow & Son Constr. Co., Huron, S. D.; Walter H. Ericsson, Henry Ericsson Co., Chicago; Fred I. Rowe, W. L. Johnson Constr. Co., Columbus, O.; Max C. Harrison, Harrison Constr. Co., Pittsburgh, Pa., and Albert D. Blakeslee, C. W. Blakeslee & Sons, Inc., New Haven, Conn.

Re-elected Directors: Charles L. Harney, Chas. L. Harney, Inc., San Francisco; Edward O. Earl, San Xavier Rock & Sand Co., Tucson, Ariz.; Carl E. Nelson, Carl E. Nelson Co., Logan, Utah; W. D. Amis, Amis Constr. Co., Oklahoma City; George C. Koss, Koss Construction Co., Des Moines, Ia.; Charles A. Long, Sullivan, Long & Hagerty, Birmingham, Ala.; F. L. Shackelford, Potter & Shackelford, Inc., Greenville, S. C.; R. P. Bayard, Johnson, Drake & Piper, Inc., New York City; S. L. Fuller, John F. Casey Co., Pittsburgh and Hal C. Dyer, Dallas, Texas.

Why a Safety Program?

By Mervyn G. Gaskin, president of Taylor & Gaskin, Detroit, Mich., at the AGC annual meeting:

A safety program pays big dividends to all of us in cash and in a clear conscience. Aside from causing needless human suffering, accidents cost money, lost pay, and economic waste. We can estimate direct financial loss of accidents but not their full effect on human health, happiness, and the standards of living. Apart from this, however, we want to give you a very selfish answer. In just two words, "It pays." It pays in the lower cost of insurance, which is a part of our overhead. It pays in the preservation of our machinery and equipment because none of us wants to ruin a $25,000 crane or similar equipment. It pays because we are able to get more and better work from our men and a better class of labor for they know we have their interests at heart . . . we are trying to protect their lives every minute of the day.

prices continued to climb all through 1948 (although 1st quarter 1949 prices are slightly lower).

Mr. Carter in his report also noted the rapid acceleration of the CAA airport program, which he predicts will include $85 millions of new construction in 1949. He stressed the importance of the work undertaken by the AGC-AASHO joint cooperative committee, which is made up of the following members:

AASHO Members: W. Vance Baise (Co-Chairman), Chief Engineer, North Carolina State Highway and Public Works Commission; A. C. Clark, Chief, Division of Construction, Public Roads Administration; C. M. Hathaway, Chief Highway Engineer, Illinois Department of Public Works and Buildings; G. Albert Hill, Connecticut State Highway Commissioner, Connecticut State Highway Department; G. T. McCoy, California State Highway Engineer; Emmons L. Roettiger, Wisconsin State Highway Engineer; and Hal H. Hale (Co-Secretary), Executive Secretary of AASHO.

AGC Members: Morris E. DeWitt (Co-Chairman), Porter-DeWitt Construction Co., Poplar Bluff, Mo.; Gordon H. Ball, N. M. Ball Sons, Berkeley, Calif.; N. K. Dickerson, Jr., Dickerson, Inc., Monroe, N. C.; Richard Hopkins, Richard Hopkins Co., Albany, N. Y.; Thomas H. Joyce, Jr., Joyce Brothers Contracting Co., Springfield, Ill.; and Archie N. Carter (Co-Secretary), Manager of AGC's Highway Division.

MacDonald Stresses Continuity

AGC's road contractor group heard PRA Commissioner Thos. H. MacDonald, who warned that only a year from now Congressional hearings will begin toward a new federal-aid highway bill extending and possibly enlarging the present program beyond 1952. He noted that the enemies of the program are already busy, and that one of their criticisms is being leveled at the time lag in getting from legislation to completion of actual road work. This lag, he noted, is about 2½ years. Road volume only now has climbed to an annual rate equal to fund appropriations. This slowness, inherent in the American democratic process of getting states, counties and cities together on a nation-wide program, is actually an asset, he said. But it makes long-range planning and programming imperative. Continuity of work is the most important thing today, for road officials and contractors alike.

Contractors can look to a permanently broadened base of highway work today, said MacDonald. Urban and secondary as well as arterial road jobs are assured in steadily increasing volume. Urban work must be sold to the local communities with a new yardstick of value measurement. The per-mile cost, running into the millions, is sometimes frightening, but not so the per-vehicle cost. As an example, he noted that the newly-completed 3-mile expressway section at Houston, designed to carry 18,000 vehicles daily, began immediately carrying 32,000, traffic of 42,000 daily being experienced at times. This expressway's $2 million-per-mile cost amounts to no more per vehicle than a $2500 per-mile cost for the average light-traffic local road.

Since the war 70,000 miles of improvements have been undertaken on the nation's 611,000 miles of arterial, urban and secondary federal-aid highways. 37,000 miles of these are completed. The biggest challenge facing highway leaders from here on, noted the Commissioner, is to perfect joint administrative machinery. Particularly the state-local relationships must be strengthened and the solution lies with state legislatures. Contractors can look to a wider use of contract methods in the secondary field, said MacDonald, who said that new methods of construction as well as new machinery for contract letting must be devised there.

AGC Safety Awards

Emphasizing its continuous campaign for safety in the construction industry, the AGC presented seven certificates to member firms which finished in leading positions in its annual accident prevention contest in the year ending Sept. 30, 1948.

Highway Division (average exposure, 293,880 man-hours): Burrell Construction & Supply Co., New Kensington, Pa., first place, above average exposure; Thorpe Construction Co., Akron, O., first-place, below-average exposure.

Heavy Division (average exposure, 839,525 man-hours): Holmes Construction Co., Wooster, Ohio, first place, above-average group; C. F. Lytle & Amis Construction Co., Cambridge, Nebr., first-place, below-average exposure group.

In the above-average exposure group of the Highway Division, second and third places went to Koss Construction Co., Des Moines, Ia., and A. J. Baltes, Inc., Norwalk, O. In the below average exposure group, George K. Werner & Son, Clay Center, Nebr., was second and the Diesel Oil Sales Co., Seattle, Wash., third.

In the Heavy Division, second and third places in the above average exposure group went to C. F. Braun & Co., Alhambra, Calif., and the Fluor Corp., Ltd., Los Angeles, Calif. In the below average exposure group, L. Walker Fauber, Ashland, O., was second and Herbert F. Darling, Williamsville, N. Y., third.

Mississippi Valley Meeting

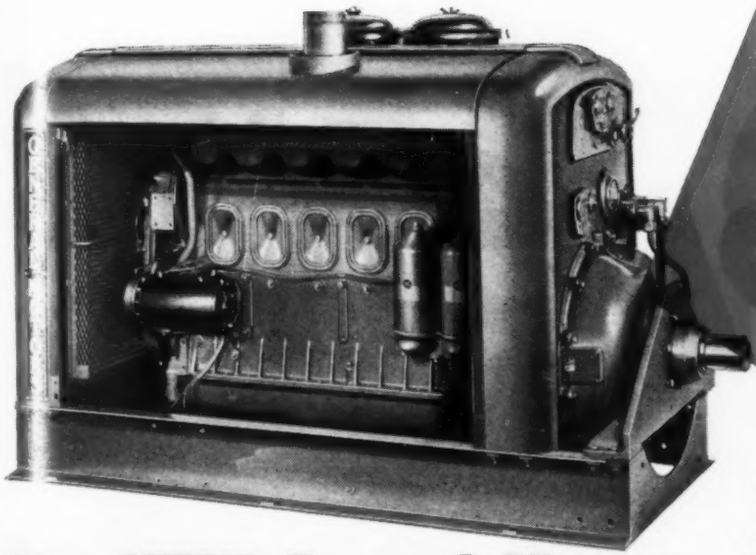
THE need for better administrative and engineering supervision of road work at local levels, and of better state-local relationships, was one of many topics aired at the 40th annual Mississippi Valley Conference of State Highway Officials, held in Chicago March 10-12. Carl E. Vogelgesang, engineer of special assignments, Indiana, was elected president, succeeding O. L. Kipp, chief engineer, Minnesota.

Here as in other national and regional highway meetings of the past winter, Commissioner MacDonald of PRA presented statements of the broadest import. Pointing to the 3 to 4 year lag between legislative effort in Washington and completion of road project, he said that the very slowness and thoroughness in getting the 3200 or more state and local agencies together on program details, assures momentum in the highway program from here on. He warned that until the states solve jurisdictional matters with their city and county governments, there will always be a campaign of sniping at existing federal-aid laws, which heretofore have steadfastly adhered to the principle of dealing only through the state highway departments. The state legislatures must clarify and strengthen the position of the state highway departments, he said.

Better County Engineering

On the subject of secondary roads, he said that many counties do not as yet have adequate engineering supervision. The state highway departments have grown strong through their sound engineering and high standards, and this should be the cue for the counties. A nation-wide inventory of the county administrative situation is being undertaken by PRA as a basis for recommending remedies to local road authorities and soundly advising Congress on federal policy. Adding more funds for local roads will not offset the lack of local engineering administration, he warned. Only one-third of the nation's counties operate on a unit basis in their work today, he said. The old supervisor system, dating from pioneer days, is still widely in force, defeating chances of central purchasing and leading to duplication of equipment. Larger rather

(*Continued on page* 70)

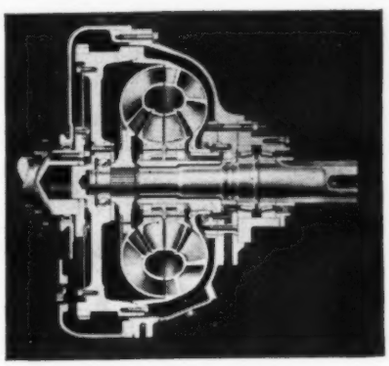


A Combination Torque Converter and Fluid Coupling *Integral with the Engine*

General Motors 71 Diesels equipped with the new GM Torque Converter take up no more space or weight than the same engines with conventional friction clutch and power take-off. Available in 3-, 4-, and 6-cylinder single engine units, Twin 4 and Twin 6 models having engine ratings from 75 to 300 H.P.

The NEW General Motors DIESEL ENGINE-TORQUE CONVERTER UNIT

HERE is a complete, integrated Diesel engine-torque converter unit that combines the inherent efficiency of the GM 2-cycle Diesel engine with the features and advantages of *both* torque converter and fluid coupling. It provides *torque multiplication up to 4 to 1* for starting variable heavy loads. It also provides *highly efficient transmission of power* during light load periods by *automatically shifting to fluid coupling* in the upper speed range.



In the new GM Torque Converter, oil does the work. Automatic transition from torque multiplication of 4:1 at stall to 1:1 in upper speed range.

A smooth, uninterrupted flow of power, delivered through a liquid, *prevents engine stalling* under any load and *protects both engine and driven machinery from sudden shocks.*

One Manufacturer—One Responsibility

Up to now most engines and hydraulic drives have been separate units. The result—compromise designs and divided responsibility. Now General Motors offers a new torque converter specifically designed and manufactured as an integral part of the General Motors Series 71 Diesel engine. It is a self-contained unit built by one manufacturer providing a long needed saving in space and weight as well as certain desirable operating characteristics not available before.

This new power unit will get the most work done in the least time because the engine operates in its most efficient speed range at all times—delivering maximum engine horsepower regardless of the speed of the load. *Maximum torque to start heavy loads PLUS maximum horsepower to keep the load moving.*

Everyone with a hard job to do in the oil fields, in construction, in mining or in logging should have all the facts about this compact, flexible GM Diesel Engine Torque Converter unit. *Write today for a complete description.*

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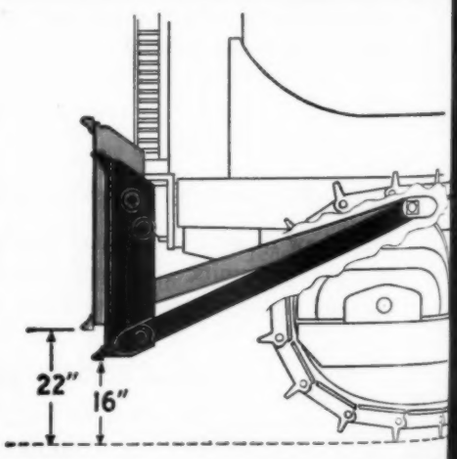
***Shortens* Time in Cut.** You get heaping loads fast with the BIG HD-19 pushing. A powerful, 40,000 lb. tractor with long, wide, sure-gripping tracks . . . it gets in there and really "bears down."

What's more — makes contact faster with any make or type scraper combination — no trundling along behind trying to catch up. Hangs on, too, throughout entire loading period — no losing scraper, no sudden, jarring contacts because there's no stopping to shift. Torque Converter automatically synchronizes HD-19's speed with speed of loading unit. And with a final, extra boost, gets scraper off to fill with a flying start. Result — MORE YARDS MOVED AT LESS COST PER YARD.



NEW HEAVY-DUTY, ADJUSTABL PUSHER PLATE NOW AVAILABL FOR HD-19. It's bigger, stronger, heavi — weighs 1,600 lbs. It's adjustable operates at 16" or 22" above ground . . pushes any make scraper or self-power hauling unit.

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And because the HD-19 is on tracks it can be used everywhere on the job — on wet, sandy or rocky going . . . no job too tough for it to handle. "Seeing is believing" . . . watch it outperform. Contact your Allis-Chalmers dealer.

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DOWEL JOINT CURB FORMS
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SHAPES, STANDARD OR SPECIAL, ARE EASILY MADE FROM HELTZEL STEEL FORMS

HELTZEL STEEL FORM & IRON CO., Warren, Ohio

(*Continued from page 66*)

than smaller government units are needed to own and efficiently employ the modern power equipment which today is the basis for all highway work. The nation-wide survey will, among other things, seek to determine which of the existing methods stem from obsolete legal requirements and which from local choice.

Looking more broadly at the picture, MacDonald observed that we are hampered by too fine a line of demarcation between state, county and township lines. There are too many legal barriers to the voluntary joining of forces in purchasing and operating equipment; the outmoded idea still holds that the agency having the jurisdiction should of necessity perform the work. Perhaps a group of counties ought to undertake jointly to improve, say, a 50-mile section of road on a 3 to 5 year stage basis, instead of each building short sections piecemeal. Joint effort of this kind would result in raising road standards and also permit road service throughout the period.

Bridge Floor Strengthening

The problem of strengthening old weak bridges on the secondary system was also mentioned, one solution being to raise the floor system to H-15 at a cost of perhaps 5% of the cost of a totally new bridge, leaving the old H-10 piers and abutments able to support occasional heavy loads in safety.

The Mississippi Valley Conference group in their general sessions heard brief summaries of 1948 accomplishments and 1949 plans by delegates from the respective states. Hal H. Hale, executive secretary, AASHO, addressed the meeting on the situation in highway engineering and the colleges. Following technical committee reports, the session passed a resolution supporting AASHO's official attitude toward illegal truck loads, which are believed to be contributing largely to the very costly road damage observed today.

Road Contractors Ask "Sooner" Payments

Following are excerpts from a talk given before the Mississippi Valley Conference by A. N. Carter, Manager, Highway Division, Associated General Contractors of America, Inc.

THE highway construction program is where the civil and construction engineers will continue to meet a big challenge. The highway engineers must write clear specifications and prepare good plans. This work must be done in a manner that tells the con-

tractor what is to be done, but leaves the contractor free to choose the equipment he thinks best for the tasks and the methods he considers the most satisfactory. In other words, the state highway department should specify results, not methods.

Prompt payment of the contractor must be arranged by the states as the work proceeds—the highway contractor's investment in equipment is huge and his financial responsibilities severe.

Discussion of the value of prompt payment would not be complete without letting you know of the recent annual AGC convention in New York and the AGC Highway Division's discussion of the general provisions for highway construction contracts prepared by an AASHO sub-committee. Contractor after contractor in the open discussion urged that the AGC members of the Joint Cooperative Committee, AASHO-AGC, make known to all state highway officials the great importance the contracting industry places on more prompt payment.

All the contractors stressed that more prompt payment is only good business, and that major benefits would result to all concerned.

In discussing the general provisions, AGC's Highway Division also considers it highly desirable that much less be retained by the state highway departments on partial payments.

Some contractors recommended that their state highway departments could make a big improvement if they would retain but 10% on partial estimates until half of the work is done and then retain only 5% of partial payments until the job is completed. Other contractors reported that their states long ago saw the value of this procedure and had already placed the policy in effect. Still other highway contractors reported their highway departments had made even greater improvement.

Other ways seen by the contracting industry to speed up highway construction include:

(1) Permit the contractor free use of new types of equipment.

(2) Be sure land is available and job ready for contractor to move in and start work, once bids are opened.

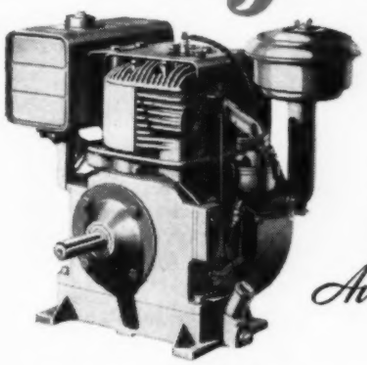
(3) Use local construction materials to a maximum, which will also reduce costs.

(4) Cut hand labor to a minimum.

(5) Award programs in contracts of various sizes.

(6) Work for greater standardization of design to permit those large savings possible where the contractor can use the same type of forms in one state as in a neighboring state.

It will pay you to select Briggs & Stratton Engines



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GASOLINE ENGINES
World Wide FACTORY SUPERVISED SERVICE

High Costs

Retard California Highway Program

The first intensive study of highway construction costs to be published, this analysis should be read carefully by contractors and highway leaders

By Richard H. Wilson,
Assistant State Highway Engineer,

Henry C. McCarty,
Office Engineer, and

Richard R. Norton,
Assistant Office Engineer, California Division of Highways

A NATURAL question is "What effect is inflation having on California's Highway Construction Program?" Highway construction has not escaped the inflationary pressure, and the following facts show that contract prices have more than doubled since 1940.

The basic elements of cost of highway construction are (1) materials, (2) wages and (3) equipment rental or ownership cost. Other factors such as overhead, supervision, taxes, insurance and profit are usually proportional to the three basic elements.

State Made Study

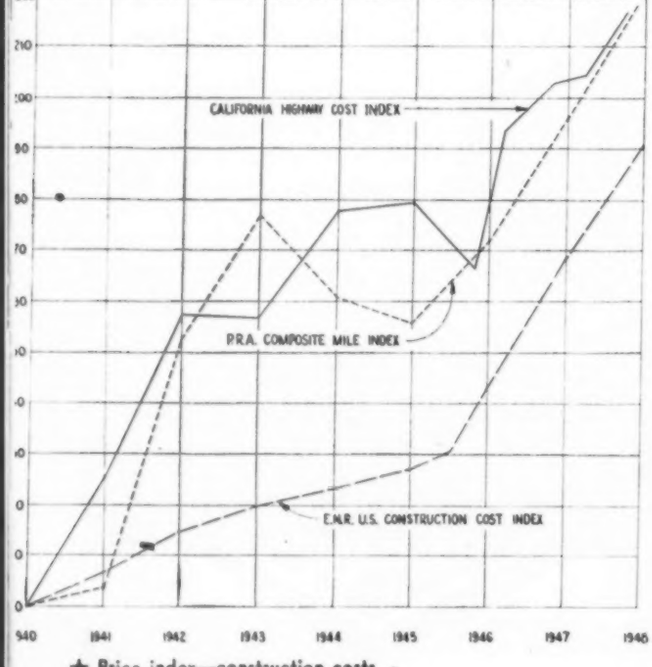
An investigation was made of the cost of materials used in highway construction covering price trends for cement, asphaltic products, aggregates, steel, lumber, corrugated metal pipe, concrete pipe, and freight rates.

The following tabulation shows a comparison of 1940 and 1948 average cost to the contractor of these materials on a statewide basis from the best available information:

Item	Unit	1940 Price	1948 Price	% Increase
Cement	Bbl.	$ 2.29	$ 3.34	46
Paving Asphalt	Ton	6.54	16.29	149
Aggregates	Ton	1.13	1.79	58
Reinforcing Steel	100 Lb.	2.37	5.02	112
Structural Steel	100 Lb.	3.65	5.16	41
Lumber	MFBM	32.36	96.17	197
CMP	Lin. Ft.	1.84	2.64	43
Concrete Pipe	Lin. Ft.	3.30	4.67	41

These price increases are shown on the accompanying charts for the period 1940 to 1948, index scale 1940 equals 100.

From the tabulated examples it can be seen that there is little uniformity in price increases from 1940 to 1948. The extreme range from 41% in price of structural steel and concrete pipe to the 197% increase in the price of lumber shows that prices are extremely unstable.



★ Price index—construction costs

An analysis has been made of the more commonly used highway construction materials to determine the average increase as applicable to highway construction costs. To determine the average cost increase, the amount of materials required to perform eight major contract items was compiled. (See table) The cost of materials required to perform that quantity of work in 1940 and in 1948 was determined and from this it was established that materials in general had increased in August, 1948, to 183% of the 1940 cost.

The average freight rate increases are those granted by State and Federal regulatory bodies since 1940 and are 144% of the 1940 rates. Labor costs were investigated from available contractor's labor statistics. These data show that in 1940 the average wage paid for an hour's labor (skilled and unskilled) on California highway construction projects was $1.01. For the first half of 1948 this figure had risen to $2.00 or 198% of the 1940 cost. Overtime paid is taken into account in the labor costs shown but other costs such as subsistence, travel time, taxes, and labor efficiency (or productivity) are not in the curve of hourly labor rates.

Overtime Pay a Factor

The sharp increase from 1941 to 1942 is probably accounted for by the large amount of overtime worked at the beginning of the war and not to a large increase in wage rates. The steady rise in wage costs show that the wage stabilization orders of the Federal Government during the war years were not entirely effective in keeping actual labor costs from rising.

There is nothing to indicate that labor costs will not continue to rise. The 1946 labor cost was $1.75 per hour. In 1947 it rose to $1.82, a $0.07 increase. For the first half of 1948 it was $2.00 or an increase of $0.18 in a six months period. As the cost of living continues to increase* (the cost of living increases at the rate of about 10% per year, according to the Bureau of Labor Statistics) it can be expected that demands for still higher wages will be encountered. The data showing the increase in hourly labor costs do not reflect the true increase in labor costs to the contractors due to the fact that labor productivity is not as great now as it was in 1940.

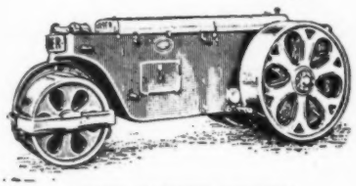
W. D. Shaw, Manager, Southern

*Cost of living has leveled off since this article was written, but no substantial drop has occurred.—Editor.

how?

USE THE HUBER MAINTAINER

On Jobs Now Tying Up Big Equipment



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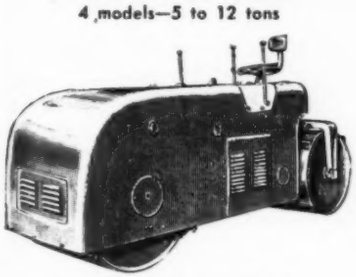

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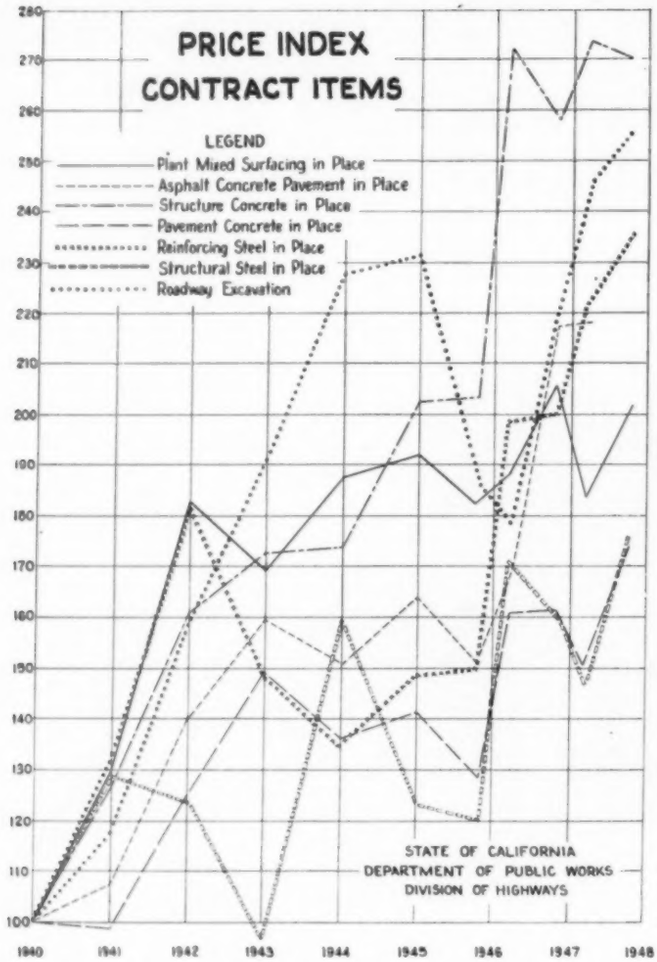
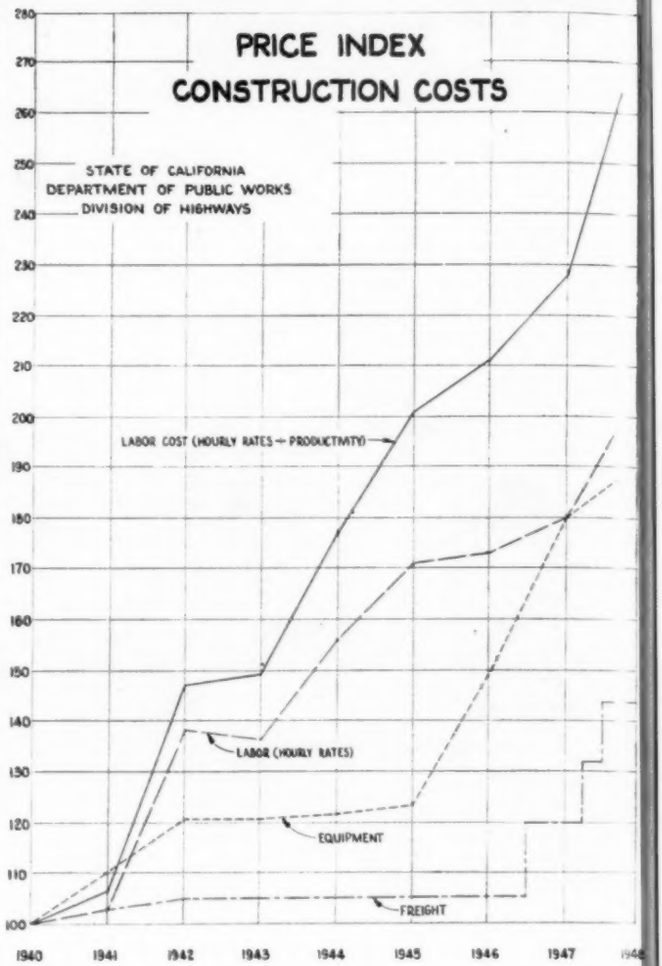




California Chapter, Associated General Contractors of America, Inc., in his letter of September 14, 1948, stated that labor productivity was now only 65% as compared to 1940. Other sources such as *Engineering News Record* estimated this factor at from 60% to 70% compared to 1940.

Offset by Mechanization

Continued mechanization since 1940 has, according to the opinions of various California highway contractors, somewhat offset the decrease in the productivity of individual workmen. In other words, the percentage of unskilled labor to total labor has decreased as a larger proportion of highly skilled labor is utilized as a result of increased mechanization.

To arrive at the true increase in labor costs at the present time a conservative productivity factor of 75% (compared to 1940) has been used. This factor was used rather than the low factor of 65%, as estimated by Mr. Shaw, as the increased mechanization in highway construction mentioned above will warrant increasing this factor to 75%. The decrease in productivity since 1940 has been applied to hourly labor costs on a uniformly decreasing basis since 1940 to arrive at the curve of actual labor cost increases.

These data show that labor costs for the first half of 1948 were 264% of the 1940 cost. (1940 cost = 100%).

The cost of new highway construction equipment has increased to 188% of the 1940 cost for the U.S., according to Marshall and Stevens of Chicago, as shown in May 27, 1948, *ENR*. Since equipment costs are fairly uniform throughout the country, the national average was used for comparison.

According to the Public Roads Administration the cost of equipment ownership and operation is now 160% of the 1940 cost, with costs rising sharply as old equipment is being replaced with new at higher prices.

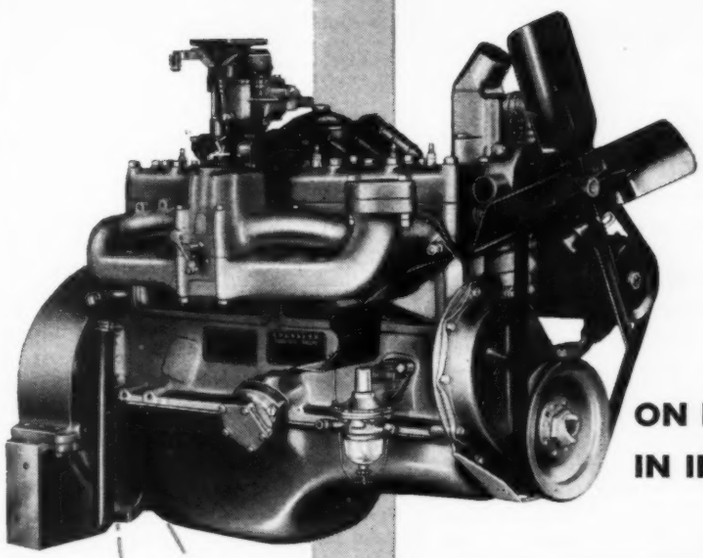
Labor Cuts 22% to 44%

From the foregoing known factors an analysis was made showing the overall increase in contractor's costs of performing highway construction in California since 1940. The factors of 45% for labor, 27% for materials, 23% for equipment and 5% for overhead costs to total costs have been determined from records of recently completed California highway construction projects. In order to determine the cost of labor, the direct payments to labor on a number of recently completed projects was compiled from notarized labor statistics submitted by the contractors in accordance with Federal requirements.

From these figures, which do not include other costs such as unemployment insurance, social security, and compensation insurance, it was deter-

Average Contract Prices

	Roadway Excavation Per Cu. Yd.	Crusher Run Base Per Ton	Plant Mix Surfacing Per Ton	Asphalt Concrete Pavement Per Ton	PCC Pavement Per Cu. Yd.	PCC Structures Per Cu. Yd.	Bar Reinforcing Steel Per Lb.	Structural Steel Per Lb.	
1940	$0.22	$1.54	$2.19	$2.97	$ 7.68	$18.33	$0.040	$0.083	
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107	
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103	All
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080	Projects
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132	
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102	
1st Half 1946	0.41	2.31	4.00	4.54	9.85	37.38	0.060	0.099	Federal Aid
2nd Half 1946	0.39	2.27	4.12	5.04	12.39	49.84	0.079	0.142	Projects
1st Half 1947	0.48	2.62	4.52	6.46	12.41	47.03	0.080	0.133	Only
2nd Half 1947	0.54	2.39	4.02	6.48	11.58	50.15	0.089	0.123	All
1st Half 1948	0.56	2.45	4.42	4.91	13.37	49.51	0.094	0.145	Projects



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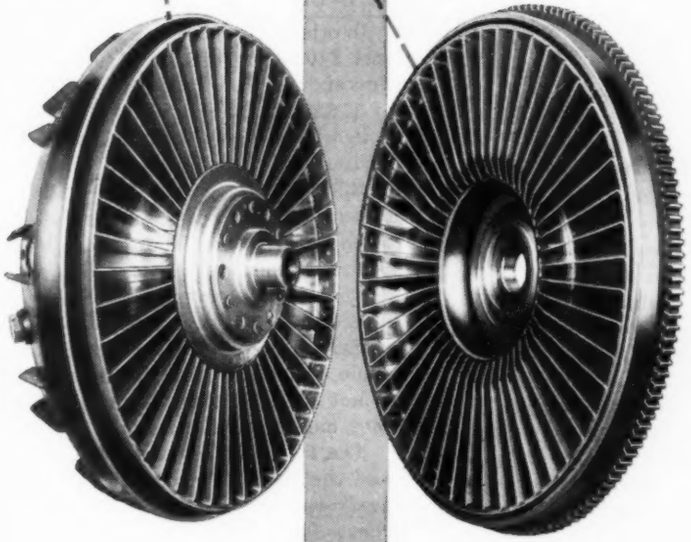

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Highlights of California Cost Analysis

- Costs of materials have increased at widely varying rates
- Highway cost rise has accelerated rather than leveled off until lately
- Labor's reduced productivity must be considered
- Increased mechanization has only partly offset labor rise
- Deliver uncertainties on material a factor not fully considered here
- Contractors are utilizing only 8 or 9 per cent of their declared contract capacity for highway work in California
- Better bidding experienced on large jobs, rather than small
- Deficiencies in California's state road system will inevitably take longer to correct, even with the new revenue sources

mined that the direct payments to labor averaged 37% of the payments to contractors by the State. This figure varied from a low of 24% to a high of 44% on various contracts. A low percentage of labor cost probably indicates a higher margin of profit, while a high labor cost may indicate a considerable financial loss on the project. The State is not in a position to determine these factors of profit or loss, and in order to arrive at average costs to the State it is necessary to use average labor costs as shown by the contractors' reports.

In order to determine actual labor costs, the payroll payments referred to above were increased by 10% to cover unemployment insurance, social security, compensation insurance, and other labor costs in addition to direct payroll payments. Then the actual payments to contractors on the same tabulated contracts used to accumulate payroll payments was determined. Although, as stated above, the actual profit to the contractor is not known, the cost to the State was reduced by 10% to arrive at the approximate contractor's cost on the assumption that the average contractor's profit is somewhere near 10%. The ratio of total labor cost (direct labor payments plus 10%) to the contractor's cost (amount paid by the State reduced by 10% contractor's profit) produced the ratio of 45% labor cost to contractor's total cost.

How Equipment Figured

Accurate statistics were available in determination of the 45% labor cost and the 27% material cost. The 23% equipment cost was determined by assuming 5% overhead cost and the equipment cost arrived at by difference between these factors and 100%.

The relative index numbers of these various construction cost factors are shown in the following tabulation. The first column is the per cent of total cost of construction represented by that item; the second column is the present cost of that item using 1940 as an index number base; the third column is the present index number cost of the item.

In the analysis of contractors' costs the intangible item of materials availability has not been taken into account. Although the term "intangible" is applied to this item, it is known to be a real factor in increasing contractor's costs. Any delays to the contractor in the delivery of materials to an orderly schedule increases his cost considerably and this must be taken into account in the preparation of bids. However, because of the impossibility of determining this factor it has not been considered in this analysis.

Contractor Costs vs. Bids

The above index shows that contractors' costs have increased 121% over 1940. The next natural question is: how does this compare with the increase in bid highway prices?

From available contract records an index has been computed of highway construction costs determined from amounts paid to contractors for highway work since 1940. This cost index is shown on the accompanying chart.

Eight major contract items have been selected for study as representative of the majority of work on State Highway contracts. In order to give the proper weight to each item the total quantity of each item for the fiscal year beginning July 1, 1947, and ending June 30, 1948, has been compiled. Following is a list of the eight items and the total quantity for the year ending June 30, 1948:

Item No.	Item	Quantity
1	Roadway Excav.	15,697,410 c. y.
2	Crusher Run Base	681,611 tons
3	Plant-Mix Surf.	1,501,178 tons
4	Asphalt Concrete	34,060 tons
5	P.C. Conc. Pave.	209,157 c. y.
6	Class "A" PCC (Structures)	163,760 c. y.
7	Bar Reinf. Steel	27,305,435 lb.
8	Struct. Steel	36,413,500 lb.

The average bid prices for these items were weighed by determining the total quantity and total cost of each item in each year from 1940 to 1948, and the average weighed bid price determined.

The weighed average bid price for each of these eight items was then multiplied by the total quantity of that item for each full year from 1940 to 1945 and for each half year thereafter. Comparative costs for the following periods are as follows:

	California Highway Construction Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946 (1st half)	166.1
1946 (2nd half)	193.2
1947 (1st half)	202.5
1947 (2nd half)	204.1
1948 (1st half)	216.8

In other words, an item of work that cost $100 in 1940 cost $216.80 in the first six months of 1948, or an increase of 116.8 per cent.

It will be noted from the preceding figures that the contractors' cost index of 221.45, as shown on page 7, is 4.65 index points higher than the index of 216.8 representing actual cost to the State. A rational explanation would be that on an average contractors are making less profit. However, with the numerous assumptions which must be made, especially labor productivity, it is not believed that the small difference has any significance.

The PRA's "Composite Mile Index" and the ENR "Construction Cost Index" are also shown plotted on the chart. These indices have been recomputed on the basis of 1940 to show the comparison with the California index. The PRA index is based on actual contract prices paid in the United States as a whole and is in very close agreement with the California index at the present time. The PRA index is 210.2 or an increase of 110.2%, for the first quarter of 1948, and 217.7, or an increase of 117.7%, for the second quarter of 1948, as compared to the California index of 216.8, or an increase of 116.8%, for the first half of 1948. The ENR index is based on a fixed amount of materials and hours of labor

Item	Per cent of item in total construction cost	Present cost of item compared to 1940=100	Present index number cost of item compared to total construction cost (1940=100)
Labor	45	264	118.80
Materials	27	183	49.41
Equipment	23	188	43.24
Overhead	5	200	10.00
		1948 Contractor's Cost Index	221.45

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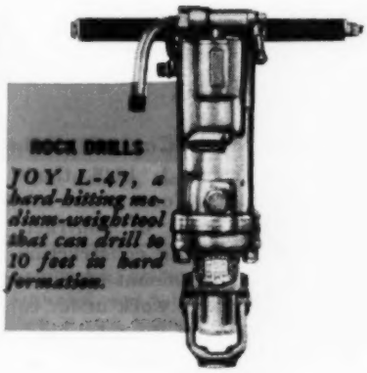

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and according to the editors is not adjusted for labor productivity, materials availability or other "intangibles" and as would be expected is lower than either the California or PRA index, based on actual overall costs.

Costs Are Accelerating

The trend shown by all three of these indices is that costs* are increasing at a faster rate than ever before and that the "leveling off" influence that was widely predicted a year or two ago has definitely not materialized.

G. Donald Kennedy in his report, dated October 15, 1946, to the California Legislative Joint Fact-Finding Committee predicted that construction costs would be twice the 1940 figure for the fiscal year ending June 30, 1947. The actual index was 202.5 for the first half of 1947 which is in very close agreement. However, Mr. Kennedy predicted that June, 1947, would be the peak of construction cost, as shown in the chart on page 113 of his report, and that costs would level off from that point to 128% of this 1937-1941 base.

From the above, a natural question arises as to the cause of this increase in construction costs. Is the large amount of highway construction now being placed under contract creating an inflationary pressure on the construction market?

On July 1, 1948, there were 507 contractors prequalified by the Division of Highways with a combined bidding capacity of $1,049,000,000 worth of highway work.

Contractors' "Capacity" Unused

On November 1, 1948, there were 283 contracts in force with a combined construction cost of contract work only, not including construction engineering, in the amount of $88,604,000.

The amount of work under contract was only 8.4% of the total bidding capacity. Therefore, it can be seen that the use of this low proportion of the available contracting capacity certainly is not a factor in increasing prices.

To illustrate the bidding capacity available the following tabulation shows the number of contractors available for various size projects:

Size of Project	Number of Contractors Prequalified
$1,000,000 and over	137
$ 250,000 to $1,000,000	187
$ 125,000 to $ 250,000	347
$ 50,000 to $ 125,000	382
Up to $50,000	507

At this point it is interesting to note the number of bids received on various sized projects advertised in the period from July 1, 1947, to June 30, 1948:

*As of late 1948—Ed.

Size of Project	Average Number of Bidders
Up to $50,000	4.5
$ 50,000 to $ 100,000	5.2
$100,000 to $ 250,000	6.6
$250,000 to $ 500,000	7.4
$500,000 to $1,000,000	7.0
Over $1,000,000	7.4
All Projects	5.6

From this tabulation it can be seen that the general trend is greater competition on the larger projects than on the smaller projects. This is at variance with the idea proposed in some quarters that contract prices could be reduced by splitting up large projects into smaller units to give smaller contractors more opportunities to bid.

Contract Size Factor

With 137 contractors prequalified to bid on projects of over $1,000,000 and with an average of 7.4 bids received on these large projects, it is evident that the size of projects advertised is not an inflationary factor, but has been in fact an influence to keep prices from increasing even more.

Since the correction of the critical deficiencies in the State Highway System was predicated on a relatively short period of high prices, with a subsequent leveling off, it can be readily seen that the continuance of the upward trend in construction costs has and will continue to offset gains in revenue under the Collier-Burns Act of 1947 and will make it impossible to modernize the California State highway system in step with population and traffic increases. In July, 1940, *California Highways and Public Works*, Fred Grumm, Deputy State Highway Engineer, estimated that the State highway system would require expenditure of $512,000,000, not including right of way costs, to bring it up to modern standards at that time. This figure was based on 1940 design standards and 1940 construction costs.

In 1946 the California State Highway Deficiency Report, which appeared in the *Senate Daily Journal* June 19, 1947, lists the cost of correcting the critical deficiencies that existed at that time as $1,173,000,000, exclusive of right-of-way expense, based on 1946 design standards and 1946 construction costs.

Estimates Need Revising

To bring both of the above up to date in line with 1948 construction costs, the 1940 and 1946 estimates will have to be expanded by the appropriate cost increase factor to make them comparable.

1940 Estimated Deficiencies = $512,000,000

1948 Price Index (1940 = 100) = 216.8

$512,000,000 x 2.168 = $1,110,000,000 = 1948 cost of correcting 1940 deficiencies to 1940 design standards.

1946 Estimated Deficiencies = $1,173,000,000

1948 Price Index (1946 = 100) = 216.8 / 179.7 = 120.6. $1,173,000,000 x 1.206 = $1,415,000,000 = 1948 cost of correcting 1946 deficiencies to 1946 design standards.

The difference between the 1948 cost of bringing the state highway system up to 1940 design standards of $1,110,000,000 and up to 1946 standards of $1,415,000,000 is due to the increase in standards since 1940.

The increased design standards are made necessary by the change in character, volume and weight of traffic since 1940. These changes require more lanes, heavier bases, pavements and structures than were contemplated in 1940.

To illustrate the unprecedented growth that has occurred in California since 1940 there follows a tabulation of some of the more important factors:

Item	1940	1948	% Increase
Population	6,907,387	10,250,000 (st. 1-1-49)	48.4
Total Vehicle Registration	2,990,262	4,010,000 (estimated)	34.0
Taxable Motor Fuel Consumed (Million Gallons)	1,733	2,959 (estimated)	70.7
Vehicle Miles per day on Rural State Highway System	21,302,000	29,373,000 (estimated)	37.7

With proper corrections taxable motor fuel consumed can be considered as a measure of total traffic on all roads and streets in the State. In 1940 the average motor vehicle in California consumed 581 gal. of fuel. In 1948 fuel consumption per vehicle was estimated at 656 gal., or an increase of 75 gal. While there has been a slight increase in the total miles traveled per vehicle per year, it has been estimated that two-thirds, or 50 gal. of the increased fuel consumption, is due to decreased mileage per gallon, caused by increases in car age and in congestion.

Cars Use More Gas

By applying this factor to the 70.7% increase in motor fuel consumed the increase in total traffic on all roads and streets in the State was determined to be 57.2%.

As the vehicle miles on the Rural State Highway System have increased 37.7% in the same period and it is reasonable to assume that the increase for the total system (Urban and Rural) is proportional to the total traffic increase in the State, then it must be concluded that traffic on the Urban State Highway System has nearly doubled.

This conclusion was reached in the following manner: the relationship between Urban and Rural State Highways was taken as 15% and 30% respectively of the total traffic in the

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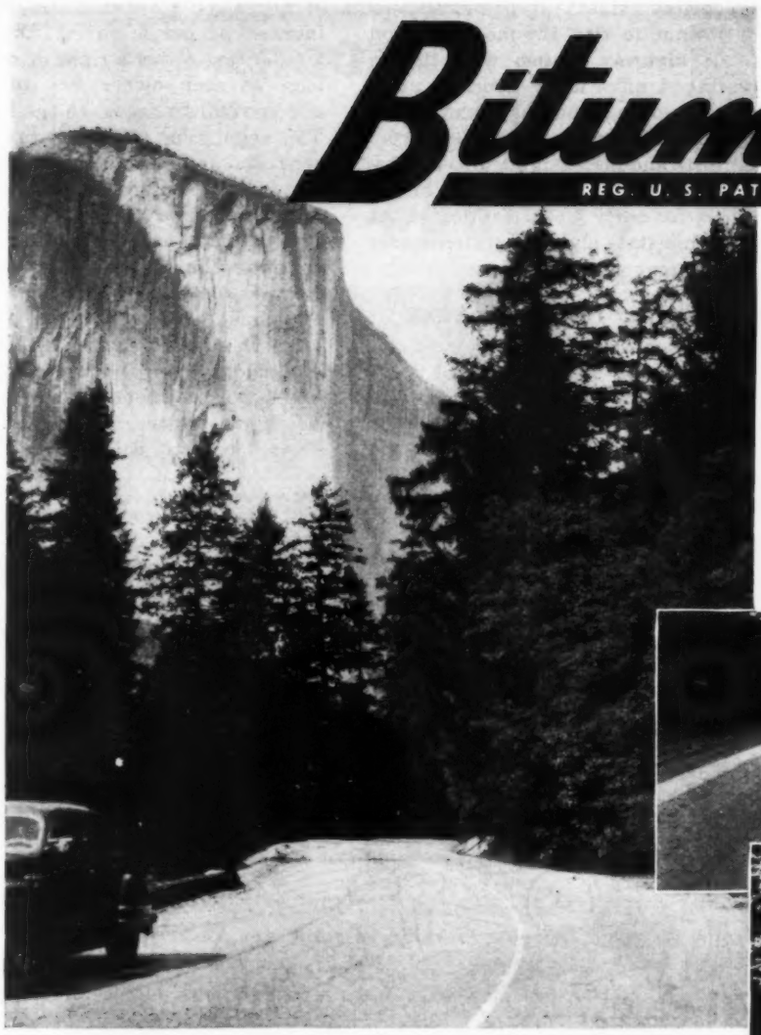

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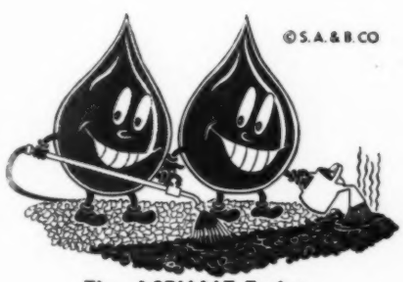

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State in 1940. This relationship was determined in 1934 and 1937 by the Highway Planning Survey and may be expressed as T = Urban State Highway Traffic and 2T = Rural State Highway Traffic, both in the year 1940. Then 3T = Total State Highway Traffic. Since we have assumed that Total State Highway Traffic has increased at the same rate as total traffic in the State, then in 1948 the Total State Highway Traffic would be:

$3T \times 1.572 = 4.716T$

The 1948 Rural State Highway Traffic would then be:

$2T \times 1.377 = 2.754T$

From the above the 1948 Urban State Highway Traffic would then be:

$\frac{4.716T - 2.754T}{T} = 1.962$ or an increase of 96.2% since 1940.

Freeways Need Emphasis

This large increase in metropolitan State highway traffic, which can be verified by any motorist in any city in California by the traffic congestion he encounters daily, shows the need for increased freeway construction in urban areas.

There is nothing to indicate that the public demand for freeway construction will not continue to increase as the freeways now under construction are completed and the motoring public becomes more familiar with their obvious advantages.

If we accept the 1946 Estimated Deficiencies, which at 1948 prices amount to $1,415,000,000 exclusive of right of way costs, then it can be seen how long it will take to correct these deficiencies without taking care of future deficiencies which are certain to occur due to the large increase in Urban traffic.

If we assume that present prices will continue without change, the deficiencies remain unchanged and current revenues available for construction remain at the present level then the correction of present deficiencies would require the following period of time:

$\frac{\$1,415,000,000 \text{ (Present Const. Deficiencies)}}{\$ \quad 70,000,000 \text{ (1949-50 Const. Budget)}} = 20 \text{ years}$

Must Face Issues

If the assumption is made that the price structure will continue to rise indefinitely or that it will level off at a point as high or higher than it is now, then we are faced with the fact that the time of correcting deficiencies in the State highway system will be materially lengthened.

If prices decline substantially and present revenues remain approximately the same, the highway construction program can be accelerated.

If prices remain at present levels or continue to rise, the modernization of the highway system with its increasing traffic must proceed at a greatly reduced and inadequate rate. The above analysis of rising construction costs and increasing traffic congestion does not present a very bright outlook for early modernization of the California state highway system under present economic conditions.

Regulation of Access

In response to an inquiry by the State Director of Highways of Ohio, the State's attorney general rendered an opinion (No. 3810, September 24, 1948) to the effect that said director of highways has the authority, in the interest of public safety, to restrict an abutting owner's right of access, so long as such owner has reasonable and convenient access to the highway. The regulation of access involved is separate and distinct from the type of access control used in connection with expressways.

Confronted with the problem of continuing in use many two-lane highways in locations where present traffic volume appears to require multiple lane or divided type highways, the State considered that some control of access was as important on the former as on the latter types of highway, from a realistic point of view.

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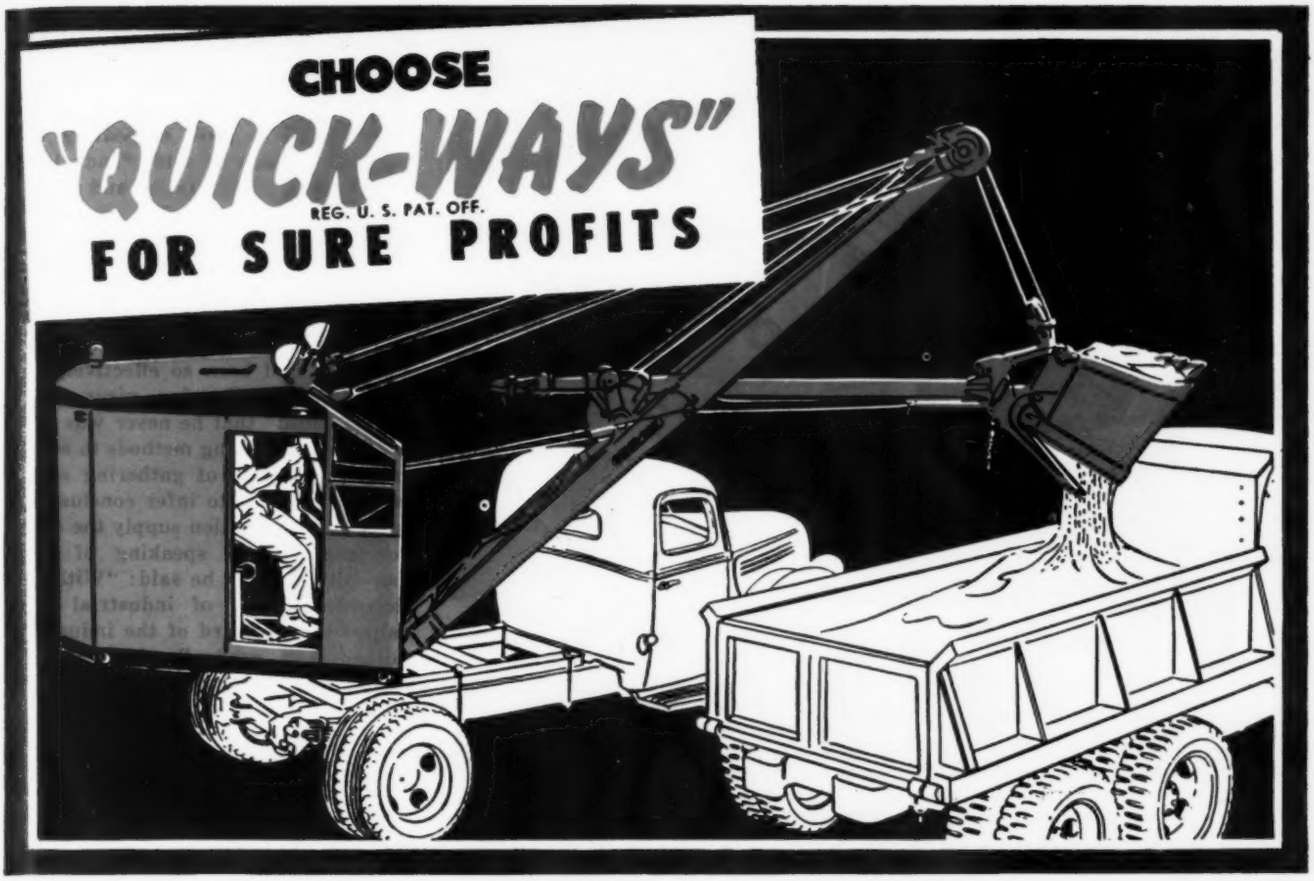

PORTABILITY AND CAPACITY . . . these are the fundamentals you KNOW you want in a truck shovel. You get PORTABILITY in a "QUICK-WAY" because it is built of steel for lightness and strength, no heavy counter-weights to slow you down. You get CAPACITY because balance and stability are designed into your "QUICK-WAY".

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NO MATTER WHAT OTHER EQUIPMENT YOU OWN, you need "QUICK-WAYS" too. There's a "QUICK-WAY" owner near you; ask HIM.

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MODEL E: 4/10 cu. yd. cap. for mounting on any standard 5-ton truck.

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DENVER, COLORADO

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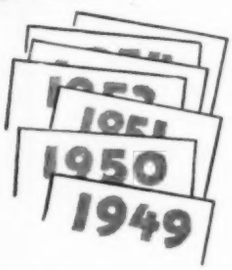

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Write for new Bulletin A-48

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Dreams Were His Data

THIRTY-THREE years ago a distinguished American electrical engineer wrote a book advocating socialism, in which he said: "Industrial competition . . . has failed and is disappearing, is, indeed, practically dead." The author was the late Charles P. Steinmetz, and his book is "America and the New Epoch." The "New Epoch" of course was to be socialism.

Before emigrating from Germany Steinmetz had been so effectively inoculated with Marxian virus from "Das Kapital" that he never was able to apply engineering methods to social problems. Instead of gathering social data from which to infer conclusions he let his imagination supply the data. For example, in speaking of real wages in England he said: "With the increasing power of industrial capitalism the standard of the industrial worker was gradually but steadily lowered, and with it his industrial efficiency." As a matter of fact, the contrary happened.

"Financially, English capital could not fight German capital, as explained above, and the only possible solution thus was recourse to force—that is, war." (p. 69).

"Thus, even if Germany should be utterly defeated and crushed, it would be only by the adoption by the Allies of the co-operative industrial organization against which they went to war, and the era of individualism thus is passed forever." (p. 86).

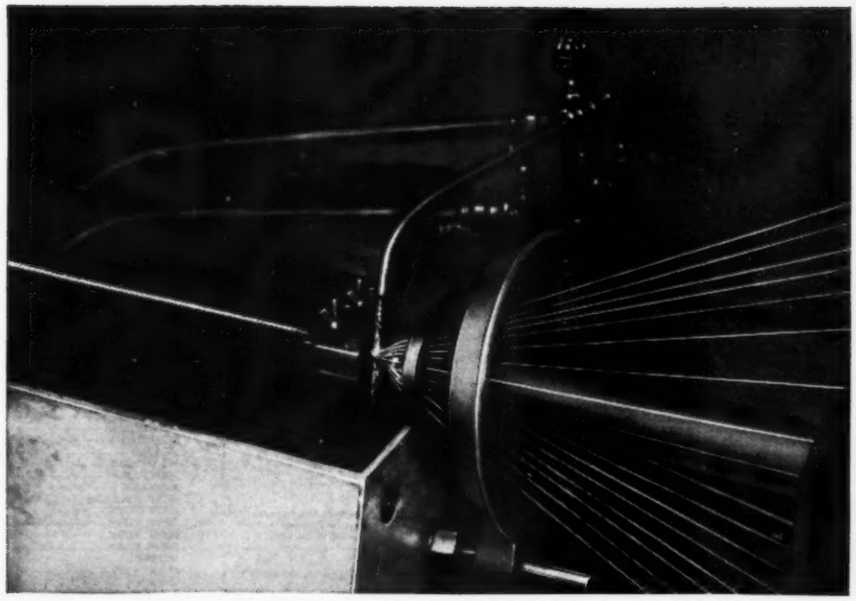
"In the meantime the old world has gone to pieces in Europe, and a new one, an era of [socialistic] cooperation, begins to rise from the ruins . . . and against the new Europe, as it will emerge from the war, our nation, with its present suicidal policy of industrial self-destruction [by competition], will be hopelessly outclassed." (p. 131).

Thus spoke an engineer-prophet who failed to use engineering fact-gathering methods, but let dreams be his data.

Aluminum Light Standards

Lowest prices since the war in New Jersey state highway department records for road light standards were received recently on projects where aluminum and steel bids were invited.

The installations are for 245 locations in Newark on the 8-lane Route 25 between Port Street and the Pulaski Skyway. The Lightning Electric Service Co., of Newark, low at $126,166 for steel posts and $126,609 for aluminum, was awarded the contract in competition with six other firms.



Hot Oil Treatment for Steel Muscles

THIS 82-PAGE BOOK ON WIRE ROPE IS FREE. WRITE FOR YOUR COPY TODAY!

Thousands of wire rope users have found that the information packed in the pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. It's easy-to-read and profusely illustrated. For your free copy, write—Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.

Field lubrication of wire rope does much to prevent friction and corrosion and should not be neglected. However, it is only a *surface* treatment. To provide proper *internal* lubrication, every strand of Wickwire Rope is actually formed in a stream of hot, quick-setting lubricant which packs the many spaces between the wires of the strand.

Fiber cores, too, are saturated with a compound that lubricates the strands after the rope has been put in service. This built-in protection is the result of years of study to develop a lubrication system that would afford protection against factors which bind ropes and result in loss of strength and rope life.

Thorough lubrication is only one step in the quality control of Wickwire Rope manufacture—but we at Wickwire believe that *every* step is important to assure finished rope that will provide the utmost in performance, safety and long life.

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FIG. 1-DISTANCE BETWEEN PRINCIPAL AIRPORTS IN CITIES LISTED AND THEIR DOWNTOWN BUSINESS CENTERS

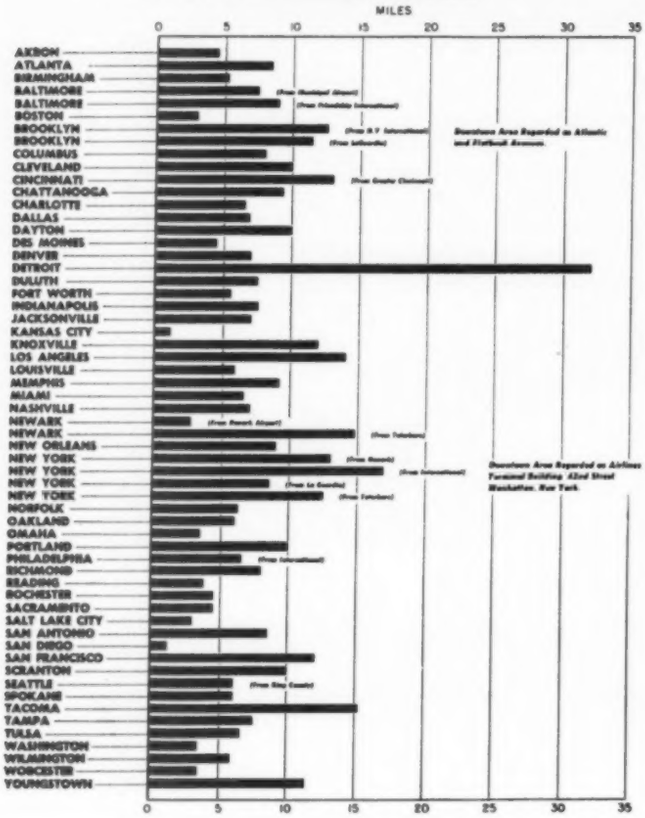


FIG. 3-NUMBER OF TRAFFIC CONTROL LIGHTS NOW REQUIRED ON EXISTING HIGHWAYS AND STREETS BETWEEN PRINCIPAL AIRPORTS IN CITIES LISTED AND THEIR DOWNTOWN BUSINESS CENTERS

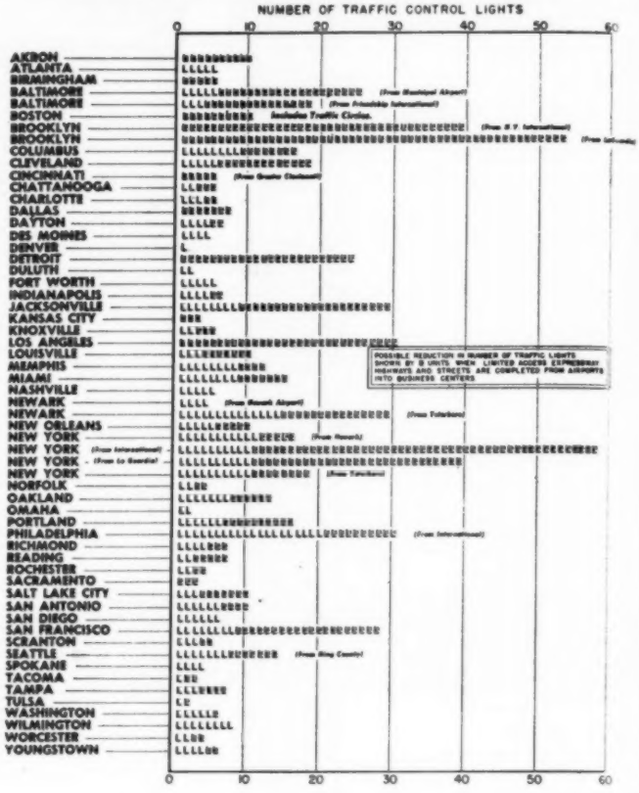
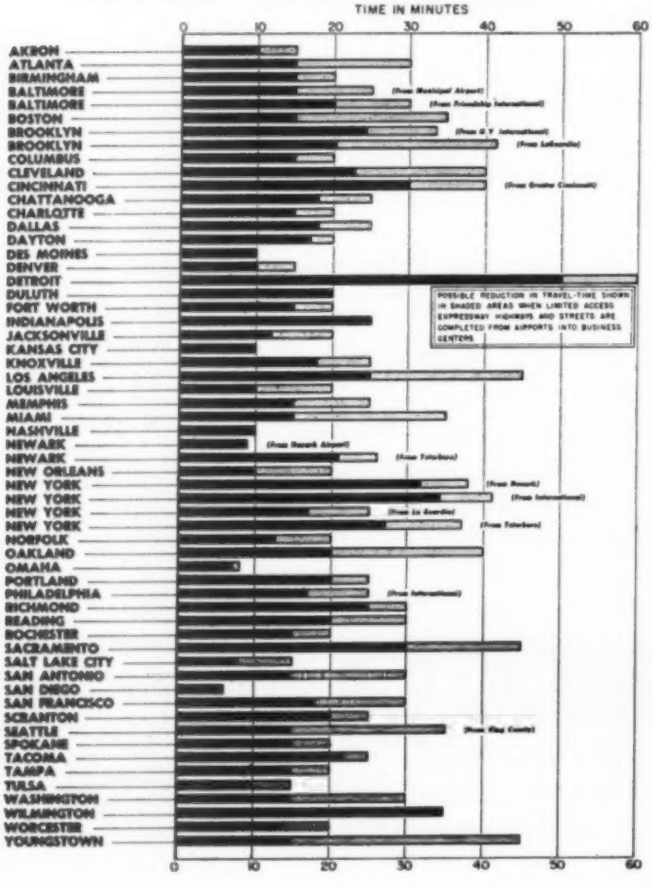


FIG. 2-TRAVEL-TIME REQUIRED BETWEEN PRINCIPAL AIRPORTS IN CITIES LISTED AND THEIR DOWNTOWN BUSINESS CENTERS



It's Still a Long, Long Auto Trip to the Airport

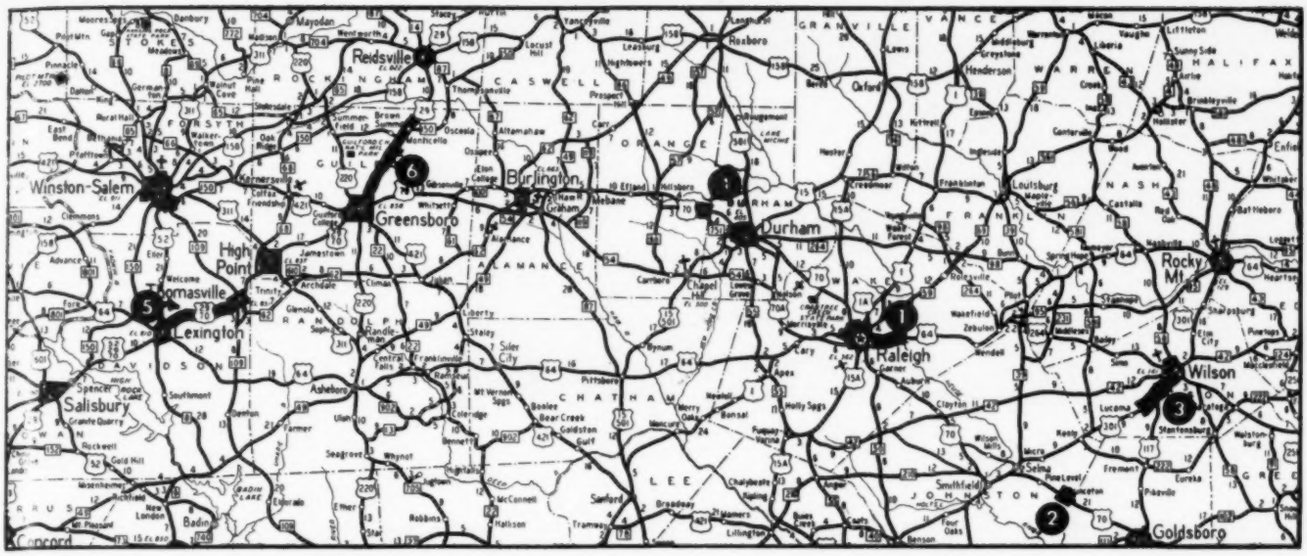
HOW far and how long is the run from your city's airport to the downtown area? And what kind of traffic-light interference must you run?

For up-to-date data on this subject we are indebted to Walter R. Macatee, manager of the Airport Division of the American Road Builders' Association, Washington, D. C. The composite answer, charted here from facts supplied by highway and aviation officials in the respective cities, is anything but encouraging. It shows, in brief, just what every traveler knows; namely, that you fly 300 mph. between cities, perhaps, but you don't do so well on the airport-to-downtown run.

Distances involved range from 1.5 miles for Kansas City to 33 miles for Detroit. Travel time today varies from 7 minutes in San Diego to 60 minutes in Detroit. Traffic lights number from one in Denver to 58 in New York (International Airport).

The estimated saving in travel time that may be realized by the construction of limited-access expressways ranges from zero in Newark (now already has express facilities) to some 60% over present time in the case of Youngstown, Ohio. In many cities from 25% to 50% of the present time can be eliminated, the Fig. 2 chart shows. Elimination of most or all of the stop lights will be one important contributing factor.

One of the resolutions passed at the recent ARBA annual meeting in Washington is that airport-to-city expressway projects be given a high priority in the federal-aid highway program, as an aid to aviation as well as municipal progress.



★ Each circular or square spot tells location of one or more contractor-owned motor graders available for ice removal work on a contract rental-rate basis. Map complete as of November first, 1948

Ballenger's "Kangaroos"

How They Paved 425,114 Sq. Yd. in 5 Hops

—another remarkable year's accomplishment by a single concrete paving outfit, using a single 34-E dual paver

A YEAR of "blood, sweat and tears" might describe 1948 for Ballenger Paving Company's concrete paving outfit as it moved about North Carolina. This organization, hailing from Greenville, S. C., placed 425,114 sq. yd. of 8-in. concrete paving on six projects during 1948.

Job 1—New Year's Day found the contractor just outside of Raleigh on US 64 with only 6,379 sq. yd. of paving left on a sub-contract under Nello L. Teer Company of Durham, N. C. (Proj. 4875, Wake County).

Job 2—The outfit then moved to Princeton, N. C., (Proj. 2350, Johnston County). This work was on US 70 and was also a sub-contract under Nello L. Teer Co. No concrete was placed during February due to inclement weather. During March the crew was able to lay the whole 20,550 sq. yd.

Job 3—With the opening of the weather, the Contractor began some long-range planning. A crew was organized to precede the paving crew and stockpile aggregate in order to cushion against the car shortage and the shortage due to over-commitment of the producers.

In March a crane was sent to Wil-

★ One of Ballenger's material set-ups. Note how equipment is strung along, affording easy access and ample stockpile room. Stockpiling is one of this contractor's "secrets"

★ This bridge, located on one of the Ballenger paving projects, affords a good example of tactful and economical rail design. Note also the riprap and paved run-down from deck drain

son, N.C., to stockpile stone for Proj. 2957, on US 301, Wilson County. This was a sub-contract under F. D. Cline Company of Raleigh, N. C. In April the paving outfit moved in and started. The project was finished in May, totaling 69,696 sq. yd. Considerable time was lost here due to delay caused by the grading and the structure contractors.

Grading Caused Delays

Job 4—From the Wilson location the equipment moved to Funston, just outside of Durham. Here the crew placed 44,200 sq. yd. for Nello L. Teer Company on Proj. 4602, US 70, Orange-Durham counties. Here again a stockpile was built ahead, and once again some delay was experienced due to the grade not being finished ahead. However, the work was finished prior to July 1.

Job 5—The equipment was then moved to Lake, N. C., a point on the Southern Railway between Lexington and Thomasville in Davidson County. This was Proj. 5283 on US 29 and US 70, and the first concrete paving job on which North Carolina specified a 24-ft. width slab in place of the 22-ft. width. This section of highway is one of the heaviest traveled in North Carolina and probably the most needed, for it replaced an obsolete 18-ft. road. The work progressed without too much delay, the greatest hindrance being shortage of labor, and for one day the contractor was out of stone, even though about half of the stone was stockpiled prior to beginning paving. The 113,581 sq. yd. on this job was finished by Sept. 1. Carl Grooms, Ballenger's highly-regarded paver operator, suffered a heart attack and his services were lost on this job.

Job 6—The last job scheduled for the year was Proj. 5355, Guilford County, on US 29 north of Greensboro. It, too, was a 24-ft.-wide job, and replaced an old worn-out 18-ft. road. This job has remarkably straight alignment and even grades for rolling country and is truly a beautiful highway (see air photo). It was the contractor's hope to complete the work prior to Dec. 1, but a series of bad breaks made it impossible; at year's end there was still 15,000 sq. yd. to go.

The least expected delay on Proj. 5355 was a shortage due to supply of coarse aggregate. Nevertheless, Ballenger ran out of stone the second week. After being out for several days, supplementary shipments from several other quarries partly relieved

- **Ample stockpiling ahead helped make this yardage possible**
- **Material supply the chief problem of logistics**
- **Having plenty of jobs lined up also was a help!**
- **Modern equipment used throughout**
- **This outfit is largely "young"; the boss-man is only 34, and a civil engineer grad. Emphasis on youthful but able foreman and superintendents**

the situation. Normally in this county one can expect October and November to be the best months of the year for outside construction. Unfortunately, it rained seventeen days in November and the production which had reached 68,515 sq. yd. in October, fell to 19,700 sq. yd. that month.

This does not tell all of the story. Ballenger experienced a two-week dead space in his cement schedule, and had the weather been good he would have lost considerable time from this cause. This should give a "you can't win" complex. Actually, the firm was out of cement only two days. A week was taken off for Christmas and when the crew came back they finished out 170,708 sq. yd. by New Year, making a 1948 grand total of 425,114 sq. yd.

Listed below is the equipment used by the Ballenger Paving Co. on this busy year's work:

Koehring 34-E twinbatch paver
Bucyrus Erie 37-B 2-yd. crane
Koehring 303 ¾-yd. crane
2 Johnson 105-ton aggregate bins
Butler 250 barrel cement bin
Williams 2-yd. clamshell bucket
Owens 1¼-yd. clamshell bucket
Caterpillar 20 KW generator set
Caterpillar No. 12 motor grader
R. B. power finegrader
Heltzel 9-in. road forms
Cleveland formgrader
Jaeger triplex "hi-pressure" pump
Cleveland form tamper
Blaw-Knox concrete spreader w/vibrator
Jaeger type H finisher
Koehring longitudinal finisher
Blaw-Knox finisher (24-ft.)
Flexplane joint machine
Graco Luber (grease outfit)
Hobart welder
2 GMC and 2 Ford 1500-gal. water trucks
2 Ford service trucks
4 Army half-tracks
2 Kohler 1½ KW light plants
For stockpiling, the contractor used a Model 25 Northwest crane and a Barber-Greene belt conveyor.

The best day's run was on the Davidson job, August 13. In eleven hours the contractor placed 1,008 batches, producing 2,365 lin. ft. of 24-ft.-wide, 8-in.-uniform slab.

Taking 52 Sundays away from 365 days left a remaining 313 possible concreting days. Actually, concrete

★ Subgrade machine in operation while a batch truck passes over

How the Ballenger Crew Progressed from Job to Job

(Square yards per month, and number of paving days)

Project	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Job #1	6379 10											
Job #2			20,550 15									
Job #3				43,505 17	26,191 17							
Job #4						44,200 18						
Job #5							56,876 16	56,705 20				
Job #6									35,885 12	68,515 22	19,700 10	42,608 14

★ A long tangent on one of the North Carolina paving jobs

was placed on 171 days. Weather, moving, and being out of material took up the remaining days. This reflects how much lost time a contractor can experience and, needless to say, how costly such delays are.

Ballenger Sold on 2-Way Radio

Perhaps the most comment received on this contractor's field methods has been on his use of a two-way radio system. The equipment was picked up originally from the Army Signal Corps and purchased from Army surplus stock, the type used in planes. The contractor installed one unit at the paver, one at the plant, and one at the office. The office was usually situated in town in order to have a telephone and be close to the freight agent, Western Union, Post Office, hospital and bank. Many people have been curious as to the benefits derived. Curiously enough, Ballenger considered it "hard to measure"; he never kept a record of trips made by a pick-up to get some small tool, or send for the mechanic, or welder, or the like. But now the plant foreman and the paver foreman can immediately tag the person or thing wanted and dispatch it. The superintendent can be contacted without chasing him from the paver to the plant to find that he has gone to the office. The contractor can call his field office at one o'clock and ask how many batches have left the plant and get an immediate answer. Ballenger states that he is sold on two-way communication although he admits that he cannot, at the moment, measure its value in dollars and cents.

Concrete mixes in North Carolina are designed on a strength basis. The mixes used on this work called for 1.4 to 1.6 bbl. per cu. yd. of concrete, depending mostly on stone source. When the contractor used his vibrating pan attached to the spreader, he was permitted to reduce his cement factor by 0.1 bbl.

The Davidson and Guilford jobs were 24-ft.-wide while the rest were 22-foot. The Wake, Wilson and Johnston jobs were let under provisions permitting membrane curing, which was used. The contractor elected use of paper curing cover on the other jobs. All of the concrete was placed on a 4-in. cushion of selected subgrade treatment material. The design did not call for expansion joints; however, the conventional longitudinal and transverse dummy groove joints were installed.

The Wake, Johnston, and Wilson County projects were handled out of the state highway division office at Wilson, R. P. Markham and Earle Crump, division and assistant division engineer, respectively. The Orange-Durham and the Guilford jobs were under the Greensboro division, T. A. Burton, division engineer, and J. W. Jenkins, assistant division engineer. The Davidson job was in the Asheboro division, L. E. Whitfield division engineer, and T. G. Poindexter his assistant.

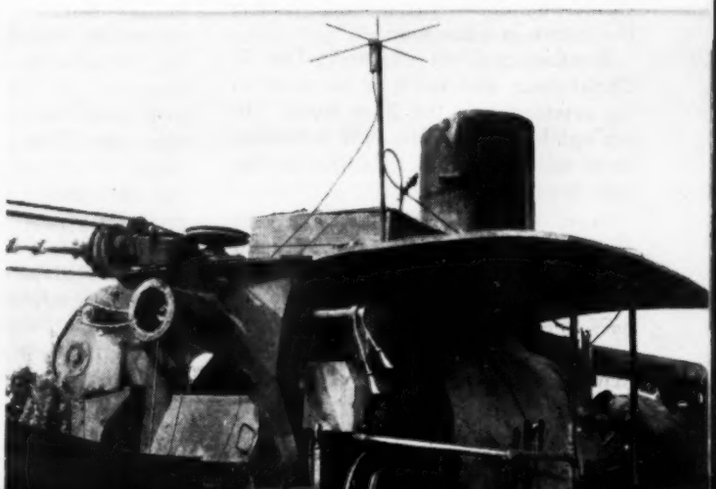
Resident engineers were as follows: Wake county, Mr. Ferguson; Johnson county, J. J. Cole; Orange-Durham counties, W. S. Sizer; Wilson county, S. O. Southall; Davidson county, Roger Dowtin; Guilford county, R. L. Hickerson.

The work was visited and checked by state construction engineer W. E. Hawkins assisted by Ed. Koontz. Chief of materials and tests C. E. Proudley designed and controlled the job mixes, assisted by Clyde Smith, Gene Thompson and Duke Morgan.

Superintendent for Ballenger on this work was James R. (Jim) Chandlee aided by Sanford Woodlief at the paver, Jimmy McCormac at the plant, J. J. Blackstock on the grade, and Addison Warren on the curing.

★ Another Contractor 2-Way Radio Enthusiast

Ballenger's mixer foreman, R. S. Woodleaf, is shown here discussing details with the plant and office. Antenna seen on top of paver. This contractor and his men are sold on radio telephone as a means of expediting the hundred-and-one daily chores



How One Paving Contractor Makes His Jobs Hum

Sidelights on the fast, efficient work of Koss Construction Company in Kansas [see Jan. '49 R&S]

RECENTLY we were privileged to publish an account of one of the fastest and neatest series of concrete paving runs ever completed in one season by a single road crew—44.2 miles in three scattered locations, with as high as 2,801 lineal feet of 22 ft. x 9 in. uniform concrete in a single day. This crew, as related by J. B. Beuerlein, superintendent for Koss Construction Company's Kansas operations, averaged around 2,500 ft. daily, and paved 22 miles on one project in 12 calendar weeks.

Mr. Beuerlein's account [see also editorial in January R & S], was good enough as far as it went, and a year previously Mr. Koss in an article on his 1947 work related some of the management factors that have made his jobs hum as they usually do.

Hoping to get further sidelights, we wrote the Kansas highway commission and in effect asked, "How does Koss do it?" Without violating any business secrets several engineers who have directed Koss projects gave very complimentary- and thought-provoking replies.

Smooth Move-ins

"As to the outstanding details," reported Frank M. Drake, resident engineer on the Koss firm's Rice County project, "I have no data to offer you that you haven't noted, unless it would be the manner in which they move on and off their projects. It is remarkable how each small department quickly erects its respective equipment or building until their camp is soon completed and ready for operation. It almost reminds one of a circus that has moved in and set up during the night, making ready for that day's performance. After the job is finished they leave in a like manner."

Another resident engineer, Don J. Christensen, was more to the point in his comments on the Koss work. "In my opinion," he wrote, "the following facts tell why Koss gets the paving jobs done:

"(1). All key personnel are men that have been with the company for several years and are probably the best in their line of work. They all have the desire to do the job according to specifications and are interested primarily in turning out a job that shows the results of good workmanship. I think this policy probably originates in the main office of the Koss Construction Company.

Keep Good Repair

"(2). All equipment used on their paving jobs is in good repair. In many cases they have two pieces of equipment for the same job so in case one fails or breaks down it can be replaced without delay. The fact that the contractor has two mixers on the job insures a good day's run even though one mixer is not able to operate. Enough equipment repair parts are on the job to take care of almost any emergency that may come up. One of the first operations you will see on one of Koss's jobs is a modern field office and good facilities for repairing equipment.

"(3). Koss's engineers are very accurate in obtaining the required material to complete a job, and every effort is made to help the Resident Engineer in seeing that all materials meet the specifications and that all required tests are made, thus avoiding any delay in regard to materials."

A third resident engineer, V. L. Carter, pointed out that his 16.856-mile paving projects done by Koss were attended by some "breaks", such as a race to finish on a day when rain began one hour after the paver reached the end of the project. This happened on October 28, thus ending the season, and entering a rainy period that lasted to cold weather.

Commented resident engineer Carter, "One of the most valuable pieces of equipment from the standpoint of utility was the "curing machine." It eliminated about 90% of the usual curing worries. It worked on the spray bar principal, applying the curing solution in one application, running on the forms, propelled by its own power unit. A machine of this type should be required by specifications on all paving projects, as it is far superior to the usual hand spray methods of applying the curing solution.

"The contractor's supervisory personnel, equipment operators, and skilled labor were all experienced and did their jobs in a workman-like manner. The equipment was good, but during the paving of the last project showed the strain of a hard season by minor breakdowns together with a few major ones; however, a good stock of spare parts was on hand and repairs were quickly made."

"16.856 miles were paved including granular sub-base between Aug. 5 and Oct. 28, 1948, a total of about 84 calendar days, which is good illustration of the efficiency of a contractor who makes paving a prime business."

Good Work Appreciated

In summing up the Koss Construction Co.'s work, L. L. Wells, general inspector, in the department of H. O. Reed, engineer of construction, state highway commission of Kansas, commented:

"We are very happy and consider ourselves fortunate in having the Koss Construction Company do a considerable amount of our paving work. They have a fast-moving, well-organized and well-equipped outfit that turns out a lot of excellent work with a minimum of commotion. Each operation is properly supervised by a man with

Day-by-Day Footage

2-Lane Concrete

(81-15 F 582 (9) 4.019 miles)

DATE		FOOTAGE PLACED	REMARKS
Aug.	30	1708	
	31	1810	
Sept.	1	0	Poured widening at US 24
	2	1903	
	3	1991	
	4	2018	
	7	2080	
	8	1619	Lost 2 hrs. on subgrade preparation
	9	2224	
	10	2210	
	11	2414	
	13	1279.75	Pavement completed
		(81-72 F.582 (8) 7.022 miles)	
Sept.	13	1215	
	14	2384	
	15	2471	
	16	2508	
	17	2021	
	18	0	No work. High wind
	20	124	Poured remainder of day on 582 (12)
	21	2451	
	22	2527	
	23	2631	
	24	1190	Lost 5 hrs. on subgrade preparation
	25	2593	
	27	2487	
	28	2562	
	29	2801	Record Day
	30	2710	
Oct.	1	2249	
	2	2155.43	Pavement completed
	4-7	.....	Moved batch plant to Minneapolis
		(81-72 F 582 (12) 5.815 miles)	
Sept.	20	2155.4	
Oct.	8	2605	
	9	2550	
	11	2623	
	12	2457	Three days lost due to lack of aggregate
	16	2346	
	18	1912	5 hrs. lost on one mixer breakdown
	19	1481	1 mixer broke down all day
	20	2021	
	21	644	6 hrs. lost—lack of aggregate
	22	1861	
	23	1697.33	1.5 hr. lost moving equipment
	25	1362.26	2 hrs. lost moving equipment around Br. # 13.4

Actual paving operations were started at the Junction of US 24 and US 81 on Aug. 20, 1948., with complete paving outfit, which included two 24E dual drum Koehring mixers. The daily paving footages on Carter's resident sections are as listed above.

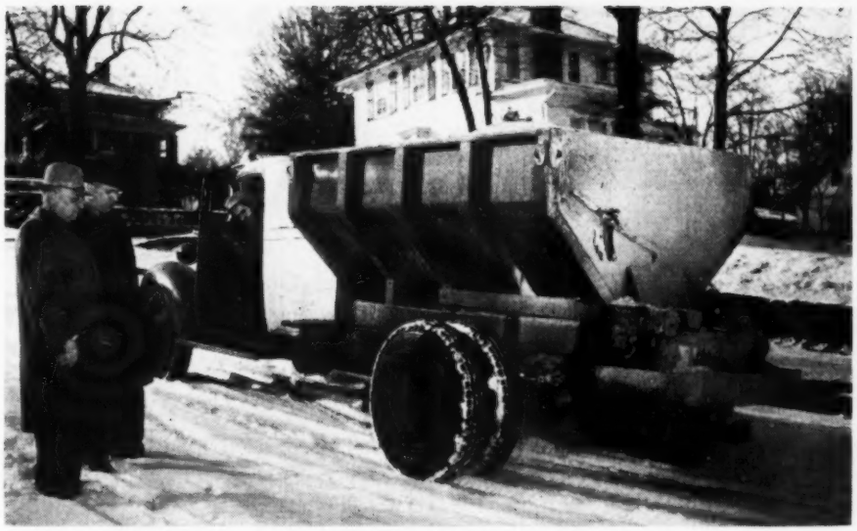
Editor's Comment

The R&S editors have no particular reason to hand out all these compliments about a particular road contractor, except that they seem to be well deserved, and seem to point to lessons in management, equipment utilization, and cooperation on results that are of more than ordinary interest to other contractors. Koss isn't the only fellow who is building roads with good efficiency in these difficult times. There are plenty of earth and rock jobs and plenty of black-topping projects, as well as concrete, progressing at a pace which would astonish old-timers. The best contractors are going far to offset inflated prices and help stretch shrinking highway construction dollars. And the best are working with instead of against the inspectors.

plenty of 'know-how.' Workmen on the various operations are highly skilled and the over-all attitude is that the proper way to do a job is 'right the first time.' Their equipment is the best and is regularly serviced and inspected by a competent mechanic force. Hand labor is held to a minimum, as there is a machine for each operation from driving the form pins with an air hammer, with the compressor mounted on a jeep, to pulling the form pins with a tool attached to a dozer blade."

Clearing House Section Outstanding Used Equipment Values

Over one hundred individual advertisers feature an exceptionally large selection of used equipment in the 13-page "Clearing House" section which starts in this issue on page 121. Readers will find the "Clearing House" a dependable and informative directory of outstanding values in used equipment and we suggest that you make perusal of these pages a regular habit each month. At any time that you have equipment you wish to sell, anywhere in the country, we suggest that you present your offerings in our "Clearing House." This section is growing faster, getting larger every month, because it's doing a better, quicker selling job—at one low cost!



★ Service Director Marvin Davis, and William Kaser, street cleaning superintendent of Akron, watching spreader apply salt-sodium dichromate mixture

Akron Tries Chemical to Arrest Salt Corrosion

By Marvin L. Davis

Director of Public Service City of Akron, Ohio

EARLY in 1945 we started a search for some kind of chemical that would inhibit the corrosive action of salt used on our streets for ice control. The complaints about rusted fenders, bodies, etc., on cars, attributed to our use of salt were most severe and the hilly terrain in Akron makes the use of salt necessary for safe driving.

Excellent cooperation was received from the research departments of our rubber plants, and in 1946 Dr. H. A. Endres and Ward T. Van Orman, research chemists, Goodyear Tire and Rubber Company, came up with the recommendation for use of either sodium or potassium dichromate. The selection of sodium dichromate by the city was based on ability to secure material and, to a lesser degree, on cost.

During the first season, we used a 1% (by weight) admixture of the sodium dichromate with salt. Additional tests and experimental work by Dr. Endres has indicated that for maximum efficiency and protection a 2% admixture is desirable, which is our present practice.

There was some fear of complaints by staining from the splashing of slush by vehicles, but no complaints have been received. Precautions were taken against dermatitis by requiring use of gloves; plus respirators when mixing in enclosed areas. No trouble has developed from the use of this material.

Throughout the winter of 1947-48, sodium dichromate was mixed with all salt scattered on the city's streets. Then in the spring, Goodyear chemists made more tests and learned from some 116 late model Akron-driven cars that 75% of them showed no effect of salt corrosion.

During the past year, we have been testing a polyphosphate, manufactured by Calgon, Inc., Pittsburgh, Pa., and sold under the trade name of "Banox." This material appears to be equal to the dichromates as an anti-corrosive material and is apparently harmless for handling. Since the presence of the dichromate is visible from its chrome color, we are using flourescine as a coloring agent in the "Banox." This dye is water soluble and can't cause any permanent staining, as might be true from the dichromates.

The public reaction in Akron has been very favorable to the use of anti-corrosive additives and the added costs appear to be considered justified.

●

Field Testing Laboratories—The Oklahoma State Highway Department is using a fleet of eight field laboratory trucks to make on-the-spot tests of materials used in road construction. The trucks, which will operate out of eight division headquarters, will be fully equipped to determine whether gravel, sand, rock and soils meet with state standards.

Heavy Grading, Streamlined Bridges, Unusual Drainage Requirements, Job Features of Allegheny County's New

Airport Parkway

LATELY the spotlight has been turned on the remoteness of metropolitan airports from downtown districts (see article in this issue). Pittsburgh is one of the cities that has its airport "way out there", the field that is now Greater Pittsburgh Airport having been located on a remote country hilltop, out of the rimmed-in and often fogged-in valleys nearer the city.

But the commissioners of Allegheny County decided to do something about the airport access problem, and in conjunction with the Penn-Lincoln Parkway now under construction [Mar. '49 R&S] a 4.7-mile branch from this Parkway to the field was designed to parkway standards. The new road, known as the Airport Parkway, is a four-lane divided road, involving extremely heavy grading through hilly terrain.

The main roadway will be 54 ft. wide. The highway will be divided by a 4-ft. divisor strip coated with white mortar cement and designed to reflect headlamp beams. The last 2.58-mile link of this parkway was graded during 1948 and paving begun on one section previously graded. The parkway gives access to a $25,000,000 airport project which will ultimately give the Pittsburgh area one of the nation's finest air terminals.

Many Culverts Required

One rather unusual feature of the work was the drainage and culvert construction. Due to the "sawtooth" terrain and deep spring-fed gullies it was necessary to construct cross-drain culverts at a rate of more than 10 per mile of roadway, with 27 culverts in all on this short project. Culverts ranged in size from 18 to 72 in., and included both vitrified clay pipe in cradle and reinforced concrete boxes. Culverts varied from 100 to 692 ft. in length. To maintain the normal drainage and to prevent road washouts, culverts were provided wherever the roadbed spanned one of the natural gullies.

Allegheny County specifications require that culverts of this nature be encased as further protection against shifting and subsequent roadway failure. As a further precaution the encasements were protected from unusual seepage by vitrified clay perforated drains running along both sides.

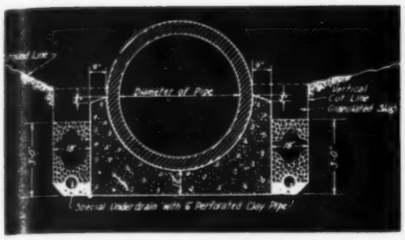
Extra-Strength Vitrified

Most of the culverts were constructed simply by hoeing or clamming out the stream bed until solid ground was reached, and then placing and jointing the pipe. After the pipe was in place, forms for the concrete encasement went down. After the forms were removed, lines of vitrified clay perforated pipe were strung alongside to collect and dispense the water which would normally settle around the encasement. The perforated pipe was filled over with 3-A gravel. Earth removed from the higher cuts was used as embankment.

Extra-strength vitrified clay pipe

★ LeTourneau and LaPlante-Choate scrapers with Caterpillar tractors performed the bulk of the grading

★ After the large box culvert was built and covered here, filling is seen in progress on job's biggest cut—nearly 200,000 cu. yd., with 80 ft. maximum depth



★ Details of special cradle for 36-in. clay and 60-in. concrete pipe culverts

★ (*Left*): Typical encased 36-in. clay pipe culvert. Two lines of 6-in. perforated clay pipe were set alongside to catch ground seepage. (*Right*): Constructing a large encased concrete pipe culvert. Note 8-in. perforated clay tile alongside

★ Dropping concrete for cradle around a 36-in. pipe culvert

was used in most culverts up to 36 in. in diameter. These culverts included one 15-in., eleven 18-in., five 24-in., three 30-in. and one 36-in. Seven other culverts, including a box, were installed. These included a 72" x 400' structure (largest in diameter); and a 60" x 692' (the longest). Another pair of 60-in. culverts, a 48-in. and a 42-in. also went into the job.

The steepest culvert was a 36" x 224' clay pipe line that drops 25.76 ft. on a 11½% grade.

The box culvert is 16' span x 250'. Because of the heavy fill load, 180 tons of steel bar reinforcement was needed in its construction. It was poured in alternate 25-ft. sections. Upon completion it was coated with two coats of waterproofing. As on all other large culverts on the job, a line of perforated clay pipe was strung along each side.

The cutting unearthed several small underground springs which had to be controlled to prevent future roadway failure. Wherever a stream was encountered it was directed through a 6 in. clay perforated drain which emptied into a culvert.

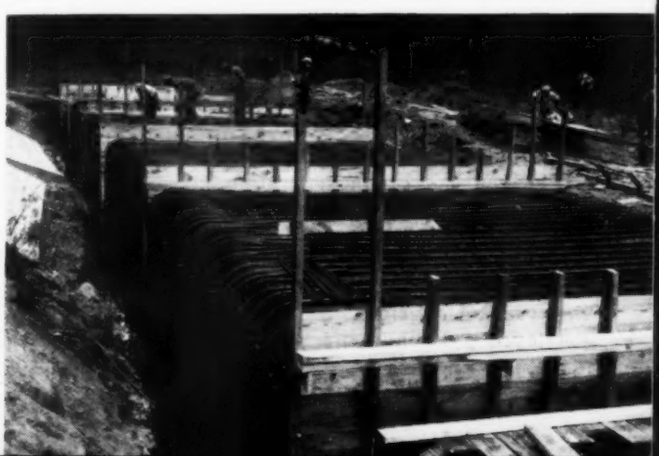
The roadbed itself will be drained with a line of 6-in. vitrified clay perforated pipe running along each side of the highway directly under the curbing. These lines empty into 15-in. lines which run beneath the highway at regular intervals. Inlets on the high side of the road empty into 15-in. clay lines which run into inlets set in the center of the road. These inlets empty into culverts. Because of the height of the finished roadway some of the manholes are 120 ft. in depth.

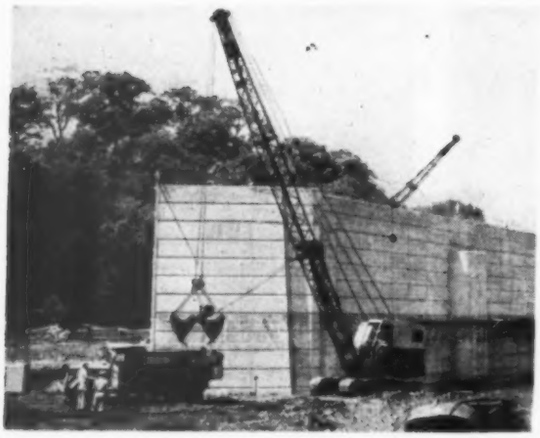
The overall project required 1,072,000 cu. yd. of earth excavation. The largest single cut was of 226,000 cu. yd. Frequent outcroppings of coal, shale and hard rock slowed cutting progress perceptibly.

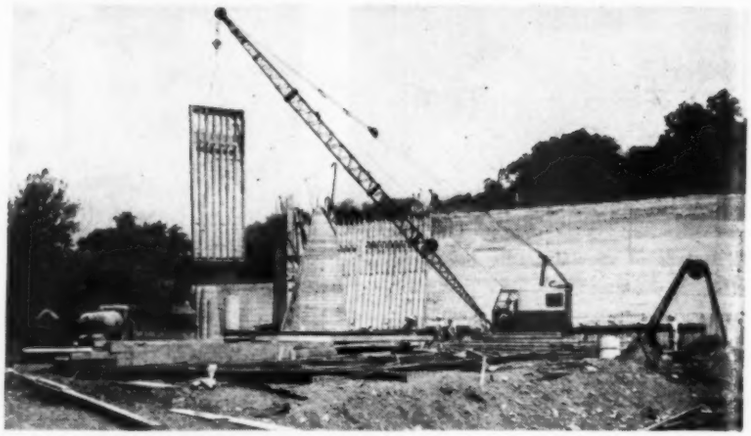
The entire drainage system requires approximately 21,000 ft. of vitrified clay pipe and 2,000 ft. of concrete pipe. Contractors had no help from the weatherman. Daily rains held up construction for almost two months. Water dashed down the culverts with flash flood force, making construction impossible.

The contract for the drainage and

★ Casting the 16-ft. span concrete box, which required 360,000 lb. of reinforcing steel







★ Scenes during construction of abutments and piers of the railway grade separation on the Airport Parkway. Rustication groves, 1¼-in. wide, spaced 30 in. intervals. Parsons, Brinkerhoff, Hall and MacDonald, consulting engineers, designers

★ Cleaning up of piers was expedited by use of power running tool and pulley-mounted working platform shown

★ Counterfort construction was used below, and smooth wall above grade line of slopes on outside of U-abutment wings

★ Inside the U-abutments counterforting is carried full height of walls

grading went to the Latrobe Road Construction, Inc., of Latrobe, Pa., for $1,186,431.50. The grading was sub-contracted to the Harrison Construction Company of Pittsburgh. Sanctis, Inc., Pittsburgh, held the contract for a railroad overpass and other structures on the project.

Harrison's earthmoving fleet at height of the job included the following:

22 Caterpillar D8 tractors
2 LaPlante-Choate 25-yd. scrapers
6 LeTourneau 22-yd. scrapers
2 LeTourneau 15-yd. scrapers
5 tractors with dozers
2 sheepsfoot roller units with heavy tractors
3 10-ton, 3-wheel rollers
3 heavy rippers
3 No. 40 Lorain crane with skullcraker
3 Gardner-Denver 365 compressors
4 Gardner-Denver wagon drills
1 Permangol horizontal drill

This outfit averaged 8,000 cu. yd. daily despite the steep going and eventually jumped to around 10,000 cu. yd. by working some of the pans on a second or night shift.

The railroad grade separation on the project, pictured herewith, consisted of three 100-ft. girder spans, with the concrete work notable for effective architectural treatment, using rustication lines. Sanctis, Inc., employed a Lima crane with 60 ft. boom, another Lima with 100 ft. boom and a fleet of White dump trucks on the bridge.

The Parkway project is under the supervision of the Department of Works, Allegheny County, Pittsburgh, Pa., Levi Bird Duff, director, Charles F. Houlihan, chief engineer. S. M. Madancy, road design engineer, was in charge of road design and preparation of detailed plans, and Ernest Tessifor, bridge design engineer; J. W. Carlson, assistant chief engineer, is in charge of construction; Arthur Godfrey and Joseph Weixel, construction supervisors. The consulting engineering firm of Parsons, Brinkerhoff. Halland MacDonald of New York City assisted the department in the preparation of plans for the bridges at the cloverleaf. James Brownfield was Latrobe's superintendent; Peter Menegus directed for Harrison; Leo Kress for Sanctis.

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In spite of removing 246 restrictions, Pennsylvania's Department of Highways still reports more than 4,000 bridges with restricted capacity or clearance throughout the state.

N. Jersey Emphasizes Expedients

New Jersey's 1948-50 state highway construction funds will be devoted 82%, or $23,588,611, for long-needed improvements on old roads in all parts of the state, and only 18% for parkway-freeway work.

State Highway Engineer Charles M. Noble has listed the following classifications in the State Highway Construction Program:

1. Resurfacing of existing worn-out pavements.

2. Dualizing existing highways.

3. Betterments for drainage and traffic conditions.

4. Building of by-passes and connecting links where necessary on new rights-of-way to relieve traffic congestion.

5. Replacement of worn-out bridges largely built many years ago by local governmental agencies and later taken into the state system.

6. Construction of Freeways and Parkways to relieve intolerable traffic congestion and to break the bottlenecks of traffic stagnation.

Highway Personnel Changes

AT the Nov. 2, 1948, election, 21 states elected new governors. As a result there have been many changes in the top personnel of state highway departments. An incomplete round-up of these new officials, as of March 15, follows:

Ohio—T. J. Kauer, the new state highway director, was employed as a highway engineer by the Ohio department of highways from 1927 to 1940, serving as maintenance engineer, construction engineer, and division engineer in Cleveland and in Columbus as federal projects engineer and acting chief engineer of construction. He resigned from the Ohio department to serve with C.A.A. in Washington, D. C., as an airport paving engineer. In 1941 he became assistant managing director of the American Concrete Pipe Association in Washington, D.C., where he remained until 1945 but resigned to act as managing director of the Wire Reinforcement Institute, Inc., in Washington, D. C. New appointments in the department include: S. O. Linzell, assistant director and chief engineer to succeed Frank M. Williams; Richard Orth, chief engineer of bridges, succeeding Glenn R. Logue; L. F. Schaeublin, chief engineer of maintenance, succeeding M. A. Ross; and L. H. Wisman, chief engineer of construction, to succeed Homer E. Anderson.

T. J. Kauer

Massachusetts—William F. Callahan is now commissioner, Department of Public Works, succeeding Wm. H. Buracker, and Francis Matera is assistant commissioner, succeeding George H. Hyland.

Indiana—Samuel C. Hadden is again chairman of the State Highway Commission, succeeding John C. Lauer. He had held this position during the previous Democratic administration, and since then had been a consulting engineer with offices in Indianapolis. He is a former president of the American Association of State Highway Officials. Ray H. Bower has been appointed chief engineer, succeeding Carl E. Vogelgesang, and Earl B. Lockridge is superintendent of maintenance, succeeding A. O. Hastings.

Illinois—Chas. P. Casey is now director of the Department of Public Works and Buildings, a position he held under a previous Democratic administration. Clifford M. Hathaway, for over 26 years engineer of construction, has been appointed chief highway engineer. R. H. Tittle has been promoted to the position of engineer of construction.

Mr. Hathaway, prior to coming to Illinois, was assistant engineer for the Rhode Island State Board of Public Roads and later was with a New York engineering firm. He came from New York to Illinois as a junior highway engineer in 1912, and was made district engineer of the district at Effingham in 1919. He was promoted to engineer of construction in Springfield in 1922 and held this position until he was appointed chief highway engineer.

Florida—Alfred A. McKethan is chairman of the state highway commission. S. P. Turnbull is state highway engineer, succeeding E. C. De Garmo, and Scott Reynolds is assistant state engineer, succeeding H. H. McCallum.

Oklahoma—The state highway commission has reorganized with the elevation of vice-chairman Paul V. Carlile to the chairmanship, succeeding John M. Craig. C. H. Mullendore is the new vice-chairman, coming up from the post of secretary, in which he is succeeded by L. M. Tittle. Oklahoma laws provide for an annual reorganization by rotation of officers, with no officer succeeding himself. Chairman Carlile is the first commissioner to have occupied all of its offices. He began as secretary with his appointment in 1947, when all eight members of the present board were named by Gov. Roy J. Turner.

Paul V. Carlile

North Carolina—Dr. Henry Jordan, a dentist and textile mill operator, is the new chairman of the state highway and public works commission. W. H. Rogers, Jr., succeeded W. Vance Baise as state highway engineer. Mr. Rogers formerly was engineer for the Pitt county highway commission. In 1931, when the state took over county road operations, Mr. Rogers came to Raleigh, N. C., as a district state highway engineer. He next became assistant division engineer and later became assistant state motor vehicle commissioner.

Tennessee—E. W. Eggleston has succeeded C. W. Phillips as state highway commissioner. Sam M. Squires has been appointed state highway engineer, succeeding Walter T. Brooks.

Rhode Island—Philip S. Mancini has succeeded Oreste Di Sata as director of public works.

Kentucky—John A. Keck, the new highway commissioner, succeeded Garrett L. Withers, who is now U. S. Senator from Kentucky. Mr. Keck is 34 years old, and a graduate of the Jefferson School of Law. He was elected county attorney of Elliott County in 1941 but served one year of his term before volunteering for service in the Army. While still in service overseas he was elected commonwealth attorney of the 37th Judicial District, a position he held until his appointment as state highway commissioner.

John A. Keck

Wisconsin—William P. Ward appointed to the State Highway commission to succeed the late David J. Summerville, was formerly office engineer in the construction department in charge of estimates, lettings and contracts. His first association with the department was in 1933, when he was in college of engineering at the University of Wisconsin. He became connected with the department in 1940. He is secretary of the state highway commission.

W. P. Ward

Georgia—Jim L. Gillis, Sr., has been appointed director state highway department, succeeding J. C. Beasley. M. L. Shadburn is the new deputy director and state highway engineer, succeeding W. R. Neel. G. W. Leftwich, heretofore maintenance engineer, is now construction engineer. C. B. Smith is the new maintenance engineer.

★ Pioneer crushing plant owned by Maine highway department, showing materials entering crusher at left and finished material being loaded into trucks at right

Ready portability of the modern crushing and screening unit used, plus its adaptability to different product demands, has resulted in important cost savings in Maine's improvement program

Crushing Stone FOR HIGHWAY SURFACES

By John C. Burnham

Assistant to the Chief Engineer, Maine State Highway Department, Augusta

FOR many years whenever the Maine State highway department was in need of crushed stone for road work the material was purchased from commercial plants. These plants being limited in number and located at relatively few points within the state made the supplying of the state's needs exceedingly difficult.

The price [late '48] of material at commercial crushing plants was about $1.25 per cu. yd. of crusher run, $1.50 per cu. yd. for material suitable for road surfaces, and about $4.00 a cu. yd. for crushed stone from which all sand had been removed. These prices did not include the transportation cost of getting the material to the jobs.

Because of an increasing need of crushed material, and to reduce the expense of transportation, it was found that a considerable saving could be made by the purchase of a portable crushing and screening plant. Although the price of material at commercial plants was not excessive it was determined that the cost to the state could be cut down materially by the reduction of miles transported. In other words, when a sizeable yardage of material is needed, it is cheaper to move the plant than to truck the material too far.

At the beginning of the 1948 road repair season, a state-owned crusher was on hand and ready to operate. This new machine was the latest model of a portable gravel crushing and screening plant. Its purchase was made in accordance with competitive bids at a cost of about $34,000. The purchase price included a 160-hp. diesel motor which has proven fully adequate for producing the power needed to operate the plant at capacity.

Good Season's Run

During the 1948 season about 60,000 cu. yd. of excellent material was produced well below commercial plant prices. In addition, the material has been produced from gravel pits within a short hauling distance of the jobs where it was used. After a season's run it has been found that crusher run material can be produced at 75c per cu. yd. Surfacing material can be produced for $1.00 a cu. yd. when allowing 25c a cu. yd. credit for the excess sand after it has been removed and stock piled. Crushed stone with all sand removed can be produced upon the same basis as surfacing material.

It has been estimated that at the end of this first crushing season, at the costs stated above, the plant will have credits of about $10,000, which will be applied toward the original investment. The credit is in excess of all operating costs covering gas, oil, grease, repairs and wages of the entire crew. It also is over and above the rental of a ¾-yd. shovel that feeds the gravel into the plant and rental of 3 or 4 trucks needed to stock pile the output of the plant.

The entire cost of the crushing plant would have been written off the first year had it received credit for the amount saved in transportation of materials used during 1948. It is reasonable to expect several years of profitable operation before other than ordinary repairs are needed. Conservative estimates are that the crusher account will be balanced at the end of the fourth year of operation.

This plant was first set up at Calais, Maine, where it crushed the material for 6 miles of betterment work on US 1. From Calais it was moved to Auburn, where it produced stone for a 14-mile stretch of route 4 through Auburn, Turner and Livermore. After completing this job it moved up through the state to as far north as the St. John River in Aroostook County. In all, the plant has traveled about 1,500 miles, crushed material for 10 jobs, and has been set up in 9 different gravel pits. It completed the season's work by crushing a 6,000-cu.-yd. stock pile in Windsor and then moving to the state garage where it was to be put into readiness for the 1949 season.

★ 10,000-yd. stockpile for betterment project on U.S. 201 in Maine

Adjustable Plant

The design of this machine is such that by different adjustments and screens it can produce crushed material of any size desired. It is possible to remove all sand or can be made to retain, in the finished product, whatever percentage of sand necessary for the type of material desired. For highway base material crusher run is normally used, of which 50% is sand and 50% crushed rock. For surface courses, all but 20 to 30% of sand is removed and all stone is crushed to a size not exceeding 1 in. If it is desired to produce a material free from sand, the rocks can be crushed to the size desired and the sand screened out during the crushing process.

Sand removed during the crushing process is loaded into trucks by a conveyor attachment and then stock piled for use as tar cover or for sanding icy pavements. Whatever sand is processed through this crushing plant is ideal for tar cover material or sanding ice because all stone has been removed.

During the past season this plant has worked entirely upon betterment projects and during that same period large quantities of additional material has been purchased from commercial plants. There appears to be little doubt but with the approval the public has given to the work made possible by the products of this plant that its operation, together with others, will continue.

Experience has shown that a definite saving of maintenance funds can be effected and a far superior riding surface produced by using a 2-in. crushed stone or crushed gravel road mix in place of the ordinary tar surface treatment. In addition, the highway users will appreciate these new riding surfaces because they will not require retreatments of asphalt or tar for several years. If all of the roads now having a surface treatment were improved with the 2-in. bituminous material, the present surface treatment work could be reduced to one-fourth of its present magnitude.

Much credit for the successful operation of this state-owned crusher plant is due to Merle L. Lancaster, who has had full charge of its operation. Mr. Lancaster, a veteran of World War 2, has had some 8 years experience in operating and repairing construction equipment for contractors.

Of the 119.12 miles of betterment projects completed in 1947 and 1948 more than 82 miles were improved with a 2-in. stone riding surface. This state-owned crushing plant produced a large portion of the stone used. There is an extensive field for this type of work in Maine, and if the present betterment program, made possible by the additional 2c increase in the gas tax, is continued, the highway user will see a marked improvement in our highways during the next few years.

★ Crusher foreman Merle L. Lancaster with maintenance superintendent John B. Church

"Point System" for Drivers OK in Connecticut

A year of operation has shown the success of a "point system" for traffic violators. Fatal accidents where responsible, count 10 points, driving under liquor influence 10, evading responsibility 8, driving while suspended 7, reckless driving 6 or 4, speeding 3, other 2, involvement but no conviction 1. When any driver's score reaches 6, a hearing for license suspension is held. Motorists are said to approve this system in Connecticut, which continues to be the nation's safest state in highway accident ratio.

Sells Heads New Group

Formation of the New York Good Roads Association, Inc., was disclosed here today with the filing of a certificate of incorporation with the Secretary of State. Anticipating an overall membership of more than 500,000 residents of New York State, the new association will seek to develop greater interest in the important part played by public highways in the economic welfare of all the people. The association plans to open headquarters in Albany within the next month. Charles H. Sells, who was New York State Superintendent of Public Works until September 30, 1948, has been appointed Executive Director of the new organization.

Centerline Marking Progress

The style of centerline and lane marking on pavements has progressed somewhat toward national standardization, according to compilation of the Committee on Roadway Markings of the Highway Research Board, A. R. Lauer, Chairman. To date 29 of the 48 states are placing markings in accordance with the national Manual on Uniform Traffic Control Devices for Streets and Highways, recently released by the Public Roads Administration.

★ Not all stone used during the year on Maine betterment projects was produced by this outfit. Roadway at left is part of a 6½-mile job commercially supplied. Stretch through small town, at right, employed state-produced materials

WITH THE MANUFACTURERS & DISTRIBUTORS

Detroit Diesel Promotes Southgate

L. Southgate

Leslie Southgate has been appointed northeastern zone sales representative for Detroit Diesel Engine Division General Motors Corporation, Detroit, Mich. He will direct the sale of General Motors Series 71 industrial and marine diesel engines through Detroit Diesel's distributor-dealer organization, in New York, northern New Jersey and all of the New England states. Mr. Southgate has been associated with the Detroit Diesel organization in various technical capacities since July of 1942 and most recently served as assistant to the marine sales manager.

New Parsons Distributor

Western Construction Equipment Co., with offices in Billings and Missoula, Mont., has been appointed distributor for Parsons Trenchliners in the Montana and Northern Wyoming area. In addition to the Parsons line of crawler and rubber-tired trenchers, the firm also handles Kwik-Mix and Koehring heavy-duty construction equipment.

Poole Promoted by Keystone

J. E. Poole

J. E. "Jim" Poole has been appointed general sales manager of the Keystone Asphalt Products Co., Chicago, Ill., a division of American-Marietta Co. In his new position, Mr. Poole will supervise both paving products and Kapco Board sales. Beginning with American-Marietta eight years ago, Mr. Poole was made technical director of Keystone two years later. Subsequently, he became sales manager of Keystone's paving products division.

I-H Executive Assignments

Three new executive assignments in the sales staff of the Industrial Power Division, International Harvester Co., Chicago, Ill., have been announced by Neal Higgins, division manager of sales. W. M. Holland, assistant division sales manager and previously responsible for distributor accounts, has been placed in charge of engine sales. In his new capacity, he succeeds W. M. Parrish, who retired March 1. I. P. Payne, formerly manager of industrial power sales for the southwest region, has been advanced to assistant division sales manager. He assumes charge of distributor accounts. Prior to his appointment as regional head in August, 1948, Payne was manager of the Houston branch. H. R. Carlson, who has been assistant manager in charge of industrial power sales for the Dallas general line and industrial district, is named to succeed Payne as southwest region manager. The region includes all of Texas and Oklahoma; most of Arkansas, Kansas and Missouri; and sections of Louisiana and New Mexico.

New Distributors Appointed

The Blaw-Knox Co., Pittsburgh, and the Foote Co., a subsidiary of Blaw-Knox, of Nunda, N. Y., have announced the appointment of four new exclusive distributors to furnish sales and service facilities and complete stocks of replacement parts for Blaw-Knox—Foote customers. Le Roi-Rix Machinery Co., 6403 East Slauson Ave., Los Angeles, Calif., has been appointed distributor in Southern California and Southern Nevada. The entire state of Idaho, Eastern Washington and Southeastern Oregon will be served by the Western Equipment Co., P. O. Box 1456, 4009 Fairview Ave., Boise, Idaho, and by Western Equipment Co. branches in Idaho Falls, Idaho (P. O. Box 96), and Spokane, Wash. (P. O. Box 2196). R. B. Wing & Son Corporation, 384-386 Broadway, Albany, N. Y., will handle Blaw-Knox—Foote equipment in Northeastern New York. In Canada, Laurion Equipment Ltd., 1801 St. Patrick St., Montreal, Que., has been appointed distributor in the Province of Quebec and in Eastern Ontario.

Bill Parrish Retires

W. M. Parrish

W. M. Parrish, assistant sales manager, manufacturers' sales, industrial power division, International Harvester Co., Chicago, Ill., retired on March 1 after more than 24 years' service. Long associated with the activities of the automotive industry, Parrish joined the Harvester Co. in 1925 to further industrial power equipment sales. Mr. Parrish served in the industrial power equipment sales section of the general office in Chicago from 1925 to 1936. During World War II he served as assistant chief, construction machinery branch, War Production Board. In 1944, when International Harvester established its industrial power division, responsibility for industrial power sales, headed by Neal Higgins, was divided between two assistant sales managers—one for distributors' and one for manufacturers' sales. Mr. Parrish at that time was appointed to his present post which he held until retirement.

Euclid Promotes Ehlert

J. E. Ehlert has been appointed district manager of the northeast territory for the Euclid Road Machinery Co., Cleveland, Ohio. Prior to his new appointment, Mr. Ehlert was employed in the Euclid enginering department and more recently was a field engineer in the sales development department. He will cover the states of Maine, New Hampshire, Rhode Island, eastern Massachusetts, Vermont as well as New Brunswick, Nova Scotia, Newfoundland and Prince Edward Island in Canada. Before joining Euclid, Mr. Ehlert spent several years in the engineering department of the Thew Shovel Co. and served in the U. S. Navy during the war.

Abrell Joins Hudson Co.

R. D. Abrell has been appointed sales representative for A. E. Hudson Co., Equipment Distributors, 120 W. Washington St., East Peoria, Ill., in the following Counties: Calhoun, Cass, Greene, Jersey, Macoupin, Menard, Montgomery, Morgan, Pike, and Scott. He replaces E. H. Klump, Jr., who has been transferred to the Northeastern territory and now covers the following counties: Champaign, Ford, Iroquois, Kankakee, and Vermillion. Mr. Abrell is well known in the road machinery and industrial equipment sales business, as he has had 15 years of experience in this line.

Heintz Appointed Sales Manager

J. H. Heintz

J. H. Heintz has been appointed Manager of Sales for the new line of self-priming centrifugal pumps for the construction industry, announced by the McGowan Pump Division of the Leyman Manufacturing Corporation. Mr. Heintz comes to Leyman with a background of many years experience in the construction and construction equipment industries. He will maintain headquarters at the Home Office, 58 Central Ave., Cincinnati 2, O. McGowan has been a leader in the design and manufacture of industrial and other types of pumps since 1852 and enters this field with almost a century of experience. McGowan self-priming centrifugal pumps will be marketed exclusively through Construction Equipment Distributors who are now being assigned territories. Many areas are not as yet assigned, and interested distributors are invited to communicate with Mr. Heintz at the Home Office named above.

New Bucyrus-Erie Distributor

Merrill-Brose Co., 11th and Howard Sts., San Francisco, Calif., has been appointed distributor for Bucyrus-Erie Co., South Milwaukee, Wis. Throughout most of northern California, Merrill-Brose will handle the ⅜- to 2½-yd. shovels, cranes, and draglines. They will also market and service the Hydrocrane, Bucyrus-Erie's all-hydraulic truck crane. Merrill-Brose Co.'s territory is bounded on the west by the Pacific Ocean and on the north by the California border; Monterey and Fresno counties form its southern limits. The eastern edge of their territory runs from Mudoc to Fresno county just inside the state line. Southern California contractors will, as before, be served by Crook Co. of Los Angeles.

New Osgood-General Distributors

The Osgood Co. and The General Excavator Co., both of Marion, O., have announced the appointment of new distributors for their power shovels and material handling equipment, as follows: Contractor's Service, Inc., of 317 W. Worthington Ave., Charlotte, N.C., for the entire state of South Carolina. This organization has represented O-G in North Carolina for many years. Dulaney Service Co., of R.R. No. 1, Box 96, San Antonio 4, Tex., for Southern Texas. The Manning Equipment

(*Continued on page* 117)

Know Your Pullers

By A. R. Kaplan

Vice President, Owatonna Tool Co.

PULLING tools for use in removing gears, bearings, shafts, bushings, sleeves, sheaves, collars, pinions, bearing outer races (bearing cups) and other tight fitting parts efficiently, and without damage, are as essential to the successful operation of a maintenance shop as a hydraulic jack or a press. The object of this article is to better acquaint service and maintenance men with the accepted operation of various types of pulling tools so that they may be able to use them to better advantage.

It is a known fact that while many shops are equipped with a good set of pullers, they are not being used properly, in many cases, and, not up to their full potential in most cases. This is due primarily to a lack of imagination on the part of the operator, and his unwillingness to read the descriptive and instructural material available to him. Because he doesn't read the instructions and study photographic applications of these tools he is unable to visualize the proper setup, or combination of pullers needed to do a job, so he condemns the pullers and resorts to a hammer and cold chisel or a cutting torch.

Fig. 1

Fig. 4

Fewer Puller Models

Some tool companies attempt to simplify the use of pullers by making a special tool for each individual pulling operation. Usually, with such tools, only one hook-up is possible and little skill is necessary to use them. However, a special puller for each individual job, considering the number of makes and models of trucks, cars, tractors, aircraft and other machines made, runs into a lot of money; they become obsolete with each model change and, too, they require considerable storage space.

Fig. 5

In the past few years the industry in general has recognized the practical utility and value of universal pullers—those pullers which can, because of their adjustable features, be adapted to many pulling jobs regardless of make or model.

Universal pullers are, generally speaking, divided into two classes, the best known of which is the "claw-type" puller with either two or three arms (Figs. 1 and 2). This type of puller is usually powered by a screw, although there is another type powered with a striking sleeve or slide hammer, and this type is commonly known as a "slide hammer" puller (Fig. 3). Both types are widely adjustable to a variety of work, but the screw-powered claw-type puller is available in capacities from 5 to 50 tons. Fig. 4 is a typical example of the use of this type of puller where no obstructions prevent an adequate gripping surface.

It might be well to say parenthetically, at this point, that it is very important to use the right size of puller. Too many times a puller has been broken and condemned because it was too small both in size and capacity for the job it was expected to do. The capacity of a puller cannot be stretched and it is better by far to use too large a puller than one too small.

Various Attachments Available

There are various attachments and adaptors available for use with the claw-type puller, such as pulling attachments (Fig. 5), and step plates (Fig. 6). These parts increase the scope and utility of your claw-type puller and are necessary to get maximum work from them. Pulling attachments are available in sizes corresponding to the sizes of the pullers. They permit obtaining a grip on bearings, gears, etc. that are too close to a housing or other obstruction to permit the jaws of a puller to grip. Fig. 7 illustrates the use of a pulling attachment with a claw-type puller and is typical of the use to which these tools are put.

Step plates (Fig. 6) are used over hollow shafts or housings to provide a base against which the puller screw can operate. In Fig. 7 the side carrier

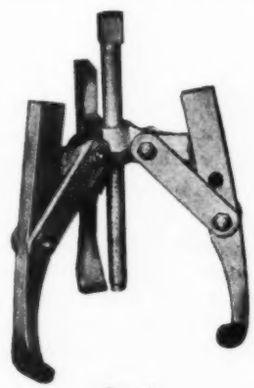


Fig. 2

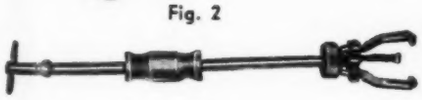


Fig. 3

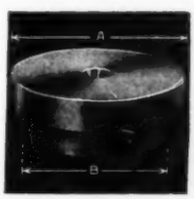


Fig. 6

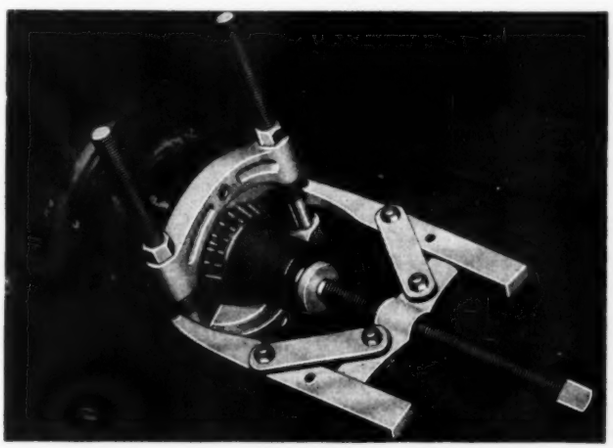


Fig. 7

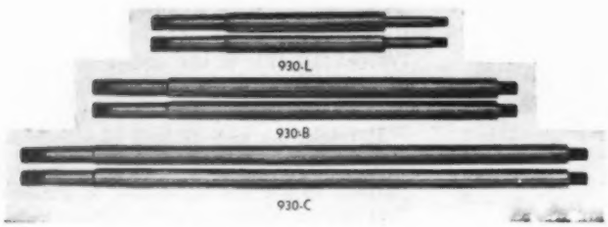


Fig. 8

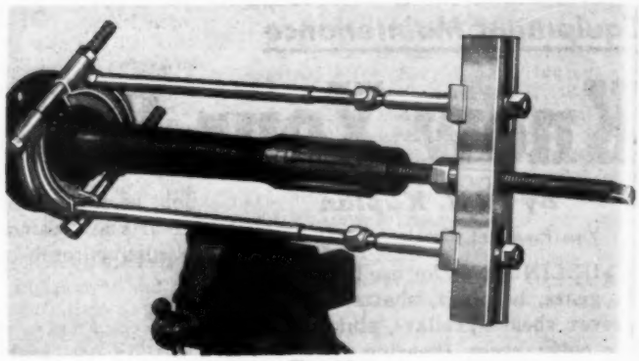


Fig. 10

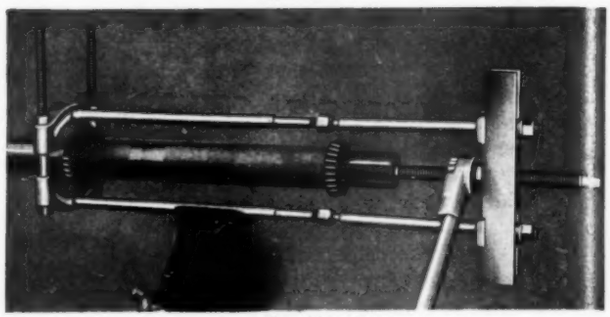


Fig. 11

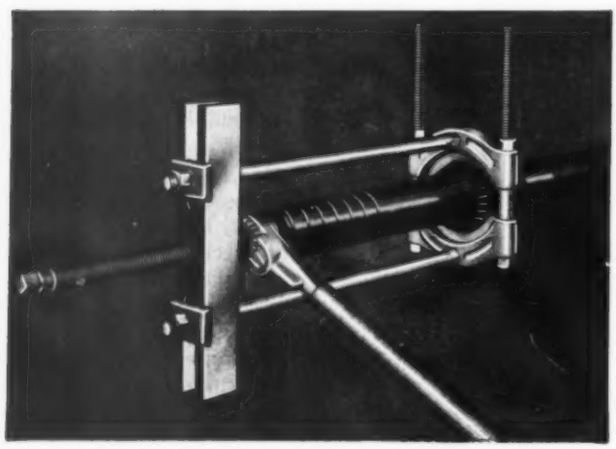


Fig. 9

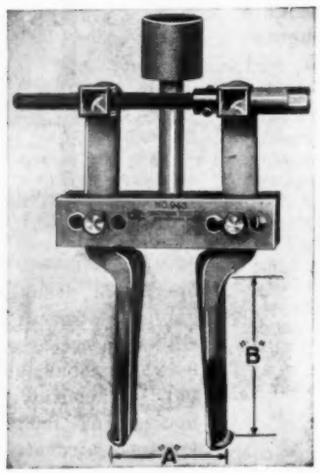


Fig. 12

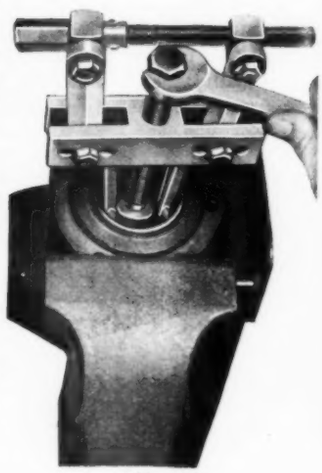


Fig. 14

assembly is hollow and a step plate must be used to successfully remove this bearing. Step plates are also used against shafts which are not centered in order to provide a center and to prevent the screw from slipping off the work when pressure is applied.

The second class of pullers most commonly used is the "bar" or "push-puller" type consisting of a slotted cross bar, screw and nut and with a series of different leg lengths to vary the reach of the tool (Fig. 8). This puller is a versatile one since it can be utilized both for removing and installing operations. It is available in several sizes from 5 to 35 tons capacity. It is used to remove and install bearings, gears, shafts, pulleys, bushings, collars, pinions, bearing outer races (bearing cups) and other tight fitting parts. A wide range of attachments and adaptors which increase the scope and utility of this tool are available.

Pulling attachments (Fig. 5) are used as effectively with push-pullers as with claw-type pullers and for the same reason. Fig. 9 shows a typical operation involving this setup. Legs for push-pullers in a variety of lengths can be joined together in different combinations, or used separately to obtain any desired reach (Fig. 10). This combination of tools is used also for installing operations just as easily and effectively (Fig. 11).

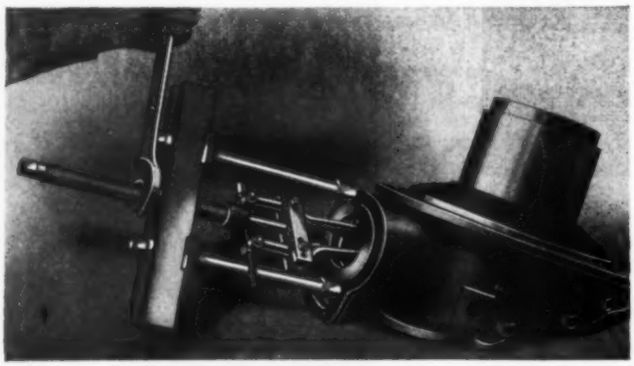


Fig. 13
(Upper left): Fig. 15. (Lower left): Fig. 16

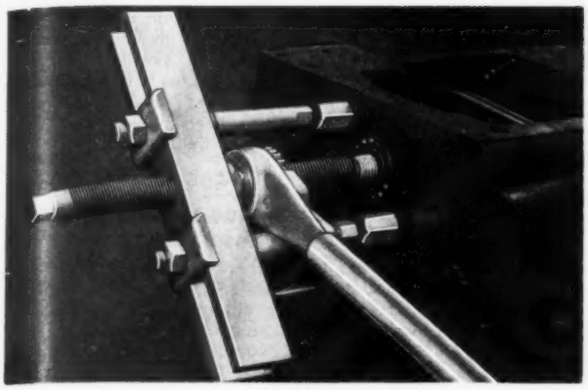


Fig. 19

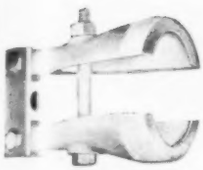
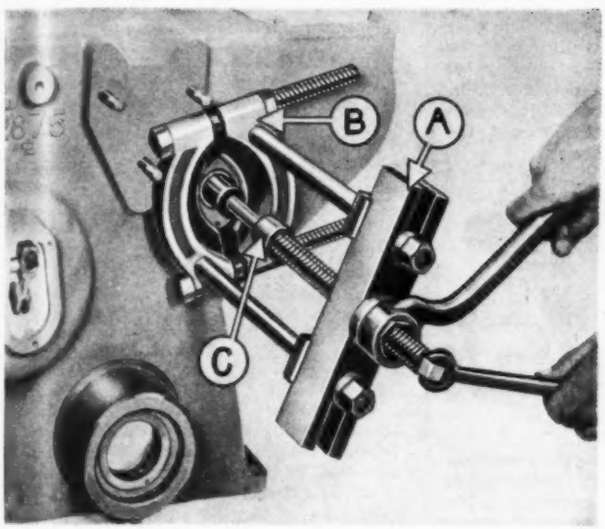


Fig. 18

Fig. 17



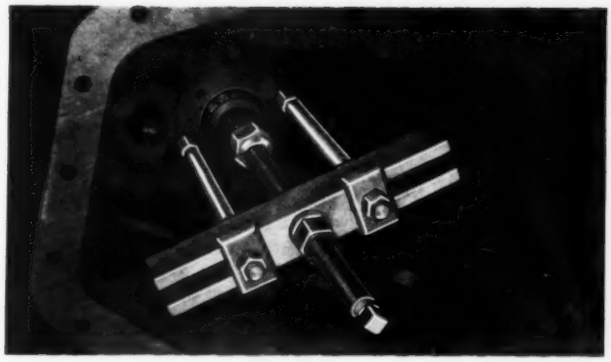


Fig. 20

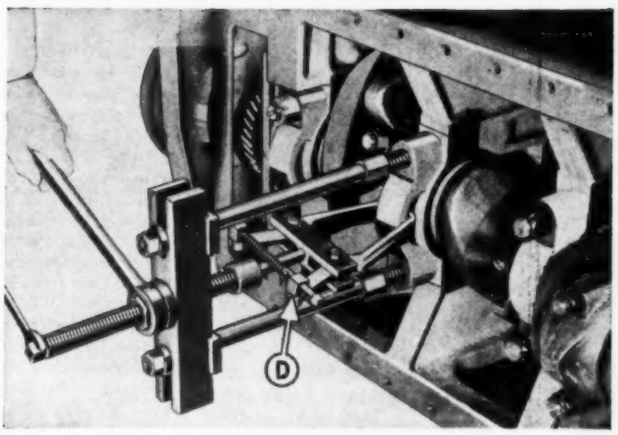


Fig. 21

Fig. 22

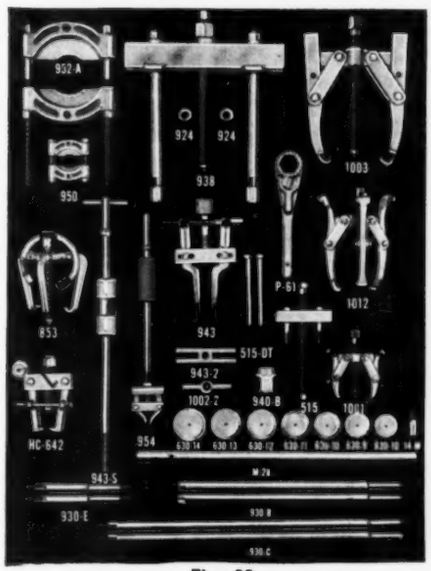


Fig. 23

To remove bearing outer races from bearing cages or housings, "bearing cup pulling attachments" in sizes corresponding to push-puller sizes are available (Fig. 12). To pull bearing outer races from blind holes without damaging the bearing race or the housing is a difficult job without adequate tools. A typical removal operation is shown in Fig. 13. This attachment can also be used with a forcing screw on similar operations (Fig. 14).

A complete range of "threaded adaptors" both male and female (Figs. 15 and 16) and step plates (Fig. 6) are also available for this tool to adapt it to a wide variety of service jobs. Several other attachments for removing bronze bushings from blind holes (Fig. 17) and pulling stub pinion shafts (Fig. 18) are also available for use with push-pullers. Typical applications involving the use of male and female adaptors are shown in Figs. 19 and 20, respectively.

Adaptions of these basic tools and their attachments are limited only by the operator's imagination. Many service operations which first appear impossible, or extremely difficult, can often be accomplished without trouble once the proper setup is arrived at. Every possibility should be explored before resorting to the cutting torch since often times expensive parts which may also be impossible to obtain, can often be removed and installed without damage. Examples of unusual combinations are shown in Figs. 21 and 22.

[Editor's Note—Technical service bulletins describing typical service jobs and illustrating service sets for maintenance are available. Service manuals covering the following may be obtained free of charge from the author's company at Owatonna, Minn. Describe whether industrial, automotive or tractor service is involved, and give make of equipment in writing.]

Clearest Days Most Perilous

Statistics compiled by the New York State Motor Vehicle Bureau show that by far the largest number of accidents occur in clear weather, on dry pavement, in broad daylight, although most of the fatal accidents occurred at night.

New York's traffic accident rate fell slightly in 1948, being 6% lower than 1947, compared to a national decline of 2%. The rate for this state was 6.5 deaths per 100 million miles of vehicle travel.

NEW EQUIPMENT AND MATERIALS

400
Dump Trailer

A custom engineered dump trailer unit, designed to meet heavy hauling and dumping requirements, has been announced by Omaha Standard, 2411 West Broadway, Council Bluffs, Ia. Any type of high tensile reinforced steel body can be provided to fully meet transportation requirements. Trailer chassis is of all structural steel

Omaha Standard Trailer

construction. All main frame members are riveted. A specially designed hoist subframe, distributes the load over entire length of chassis and provides a low mounting height. Extra heavy duty, double lifting cam type hydraulic hoists are furnished in accordance with load requirement. The Omaha Standard dump trailer can be equipped with any special feature necessary to individual job requirements.

401
Excavator

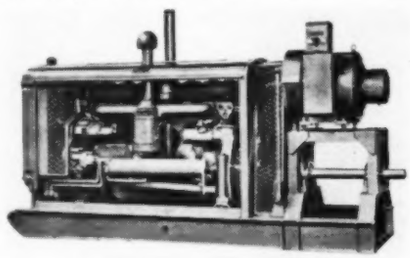
Its newly designed Type 72, a 1¼ cu. yd. excavator and material handling machine, has been announced by The Osgood Co., Marion, O. Three models are available: The Model 720, a shovel, dragline, clamshell, crane or hoe, with all front end attachments interchangeable; the Model 725 Mobilcrane, and the Model 727 dragline, clamshell or crane. Redesigning of several of the features of the Type 71, predecessor to the Type 72, has resulted in

Osgood Model 727

making a good machine better. These improvements include a new type crawler unit, with each tread belt independently controlled, and the addition of the new Osgood type hook rollers. Heavy brackets supporting the rollers are mounted at each corner of the deck. Further stabilization of the superstructure on the crawlers is through a gudgeon which is part of the crawler base casting. The Type 72 is equipped with the time-proven Osgood air control. Patented "air-cushion" clutches apply metered air pressure to the working parts smoothly and evenly. The patented Osgood rotary coupling takes air pressure down through the vertical travel shaft to the steering clutches and brakes, without twisting or straining air pipes. The Model 725 Mobilcrane is a one-man operated, one-engine machine, mounted on a rubber tired wheel mounted chassis. Independent travel unit provides one or two speeds forward and reverse (as the customer requires). The Model 727 includes special features for levee and other dragline work as well as clamshell and crane service.

402
Mech-Elec Diesel Unit

What is believed to be the first "packaged" diesel power unit capable of providing both electricity and mechanical driving power simultaneously has been announced by the Murphy Diesel Co., Milwaukee 14, Wis., who call their new power plant, the Mech-Elec Unit. Any fixed or variable proportions of mechanical and electrical loads can be handled providing the combined total does not exceed the rated capacity of the engine and that the electrical load does not exceed 50 K.W. Generator can be operated without engaging mechanical drive. Two models are currently available, the Model ME-6, rated at 135 H.P. continuous, 160 H.P. intermittent and the



Mech-Elec Diesel Unit

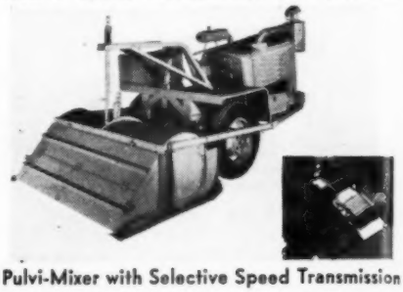
Model ME-66, rated at 150 H.P. continuous, 180 H.P. intermittent. Both models are equipped with 50 K.W. generators. The engine ratings indicate the total power available for mechanical output. The units are stated to be particularly suited for applications where the advantages of mechanical drive are desirable for the major load but where the flexibility of electric power is also desirable for secondary loads.

403
Highway Marking Paint

A new highway marking paint, reported to be capable of withstanding a wide range of weather conditions and traffic flow, has been announced by Goodyear Tire & Rubber Co., Akron, O. The company's synthetic rubber resin, Pliolite S-5, is used in the paint formulations. It is stated that because this resin is non-oxidizing, eliminating tendencies to "skin" or settle, the paint may be handled with a minimum of time and labor required, Thies explained. It is further stated that spraying is accomplished with little or no bleeding and the paint has good penetration through dirt and grime. Such penetration, combined with the paint's ability to bite and anchor results in tough, long-wearing films. Resistance of Pliolite S-5 to moisture and alkalis is another factor in durability in that the good initial adhesion is maintained. The resin's apparent insensitivity to weather at the time of application and its good weathering resistance during exposure also contribute to its excellent service. Large scale applications of stripes on thousands of miles of all types of improved roads have been made under every variation of field conditions.

404
Pulvi-Mixer Has Selective Speed Transmission

The pulvi-mixers of Seaman Motors, Inc., 305 N. 25th St., Milwaukee 3, Wis., are now being equipped with a selective speed transmission which provides a variation in rotor speeds best adapted to the job requirements. The addition of the selective speed transmission is stated to



Pulvi-Mixer with Selective Speed Transmission

permit pulverization to a much greater depth; the mixing of aggregate of much larger diameter; better pulverization of stiffer clays and more thorough blending of stonier soils. The selective speed transmission, now standard on all motorized models, is claimed to extend the use of the pulvi-mixer to many types of construction activities that were heretofore impractical —such as deep treatment of sub-bases, doctoring of frost-boils, and the large scale construction of macadam roads and airport bases.

405
Bow Saw

A new 20-in. bow saw, designed to cut timber in any position without pinching, prying or wedging, announced by McCulloch Motors Corporation, 6101 W. Century Blvd., Los Angeles 45, Calif., is claimed to save time in logging small timber. Power is supplied by the same special 5-hp. McCulloch unit used with the company's other chain-saw models, thus the bow can be interchanged with any length of straight blade and chain up to 5 ft. All of the features of the McCulloch chain saw have been retained in the new bow model: full 360° swiveling, automatic clutch, automatic control of chain tension, kick-proof starter, special fast-starting magneto,

McCulloch 20-In. Bow Saw

operation of the engine in any position, and the Rip-Cross chain, which never needs setting and which is easily sharpened by hand filing without removing chain from saw. The entire saw weighs only 63 lbs. complete.

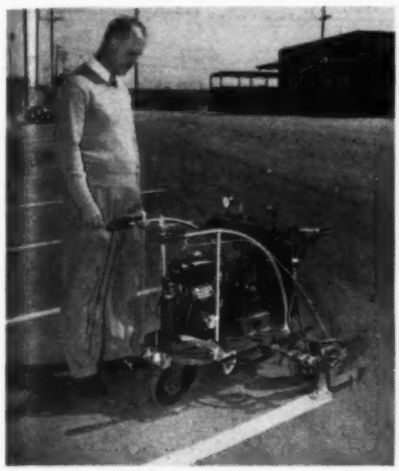
406
Truck Soap

A new powdered compound especially designed for washing painted surfaces of trucks, cars, busses and other vehicles,

introduced by Pennsylvania Refining Co., 2686 Lisbon Road, Cleveland 4, O., is stated to chemically loosen and wash away all dirt and grime. Named Penn Drake car soap, and made of synthetic bases, the powder is easy and economical to use, and is harmless to fine finishes and the hands. Maker states that the product dissolves easily and thoroughly in lukewarm water thereby assuring the user of maximum results. High soap content reduces washing time and labor up to 50% and permits use in proportions as low as one tablespoon per gallon of water.

407
Traffic Line Markers

Two new units have been added to the family of line marking equipment of Universal Manufacturing and Sales Co., 8716 Santa Fe Blvd., South Gate, Calif. These units are the Mark-Rite "Line Master" and Mark-Rite "Econo-Line." The self-propelled "Line Master" is specially designed for use by municipalities and industrial organizations where it is desirable



The Line Master

to maintain a substantial footage of line. It reproduces lines from 2 in. to 6 in. width. Wider lines may be obtained by the addition of an extra spray gun. This machine may also be utilized as a portable spray rig. A quick coupling hose connection is provided so that a standard paint gun may be attached to the pressure pot. The "Econo-liner" is a light duty traffic marker and is specially developed to fill the requirements for smaller municipalities and interior industrial marking where limited line footage is maintained.

408
Tower Loader Attachment

A special tower loader attachment for discharging concrete batches to forms above ground level or into trucks, announced by the Kwik-Mix Co., Port Washington, Wis., can be fitted to either the model 11-S or 16-S mixers. Kwik-Mix is a subsidiary of the Koehring Co., Milwaukee. Maximum discharge height is 9 ft.-2 in. The bucket handles a full batch directly from the discharge chute of the portable concrete mixer. Discharge at top of tower is completely automatic. Bucket travel and discharge is completed during the time the following batch is being mixed in the mixer drum. Operated by a special hoist, the loader is fully controlled by a single lever located on the operator's platform. The hoist is mounted within the mixer frame and is powered by the mixer motor. Hoist clutch is disengaged automatically when bucket

TOPS for black top highway surfacing

The Hi-Way Model "R" Material Spreader—Traction Driven

Save time, labor and material with the Hi-Way Model "R". Fast, accurate operation. Spreads chips, rock, gravel smoothly —no thick and thin spots to waste time and material. Ideal for seal coats on oil. Operates forward or reverse simply by shifting lever. Adjustable feed gate controls thickness of spread, width is adjusted from one foot to full width of spreader. Entire unit balanced for quick, easy hook-up to truck. Available in 6 widths from 8 to 13 ft.

MODEL "DD" SPREADER—MOTOR DRIVEN

Clamps onto tailgate of any dump truck. Handles sand and cinders for ice control, calcium chloride for dust control, equally adapted for seal coat work. Does the work of 5 men casting by hand. 1½ H.P. Briggs and Stratton power.

WRITE FOR COMPLETE DETAILS

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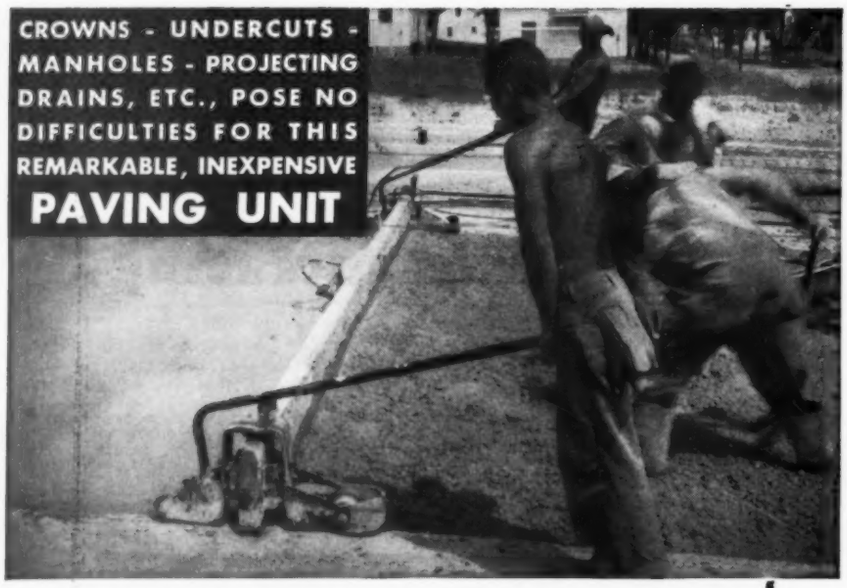
MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS



JACKSON MUNICIPAL PAVING UNIT

PLACES PERFECTLY UPWARDS of 65 Cu. Yds. OF STIFF MIX CONCRETE PER HOUR

Unit consists of an electric, vibratory, manually guided paving machine and Jackson Portable Power Unit.

It will undercut at the side forms; strike off to crown (both regular and inverted); roll back for second passes.

Thoroughly vibrates concrete in slab depths up to 10 inches and is quickly adaptable to any slab width from 6 ft. up to any practicable width.

Works right up to and around sewers, manholes and other obstructions.

Machine has such strong tendency to propel itself forward that little effort is required. Operators work from front, rear or sides.

For handling municipal paving jobs, highway patching and bridge decks quickly and at a minimum of cost there is nothing like it. Write, NOW, for complete facts.

OTHER MONEY-MAKING PAVING EQUIPMENT:

Jackson Vibratory Paving Tubes for vibrating full slab-widths of highway and airport paving; Jackson Side Form Vibrators for attachment to standard finishers or spreaders to eliminate manual vibrating; vibrators for every type of construction.

Power plant usually furnished with Paving Unit: 1.25 KVA, generates both single and 3-phase 60 cycle AC. Also suitable for operating lights, vibrators, contractors tools.

Manufactured by

ELECTRIC TAMPER & EQUIPMENT CO.

for

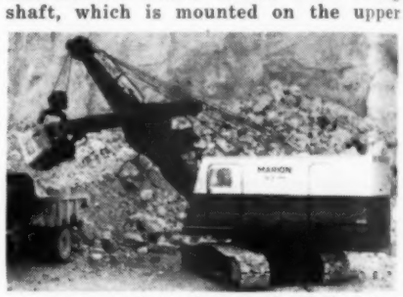
JACKSON VIBRATORS, INC., Ludington, Mich.

Tower Loader Attachment

reaches discharge height. In addition to being a fast and easy installation, the tower loader does not hinder the mobility normally attributed to 11-S and 16-S mixers. For job-to-job movements, the tower can be collapsed quickly and positioned for ample road clearance. It may be moved on a job location without collapsing.

409
All-Electric Shovel

The new Marion 93-M Ward-Leonard all-electric shovel, announced by Marion Power Shovel Co., Marion, O., carries a 2½ cu. yd. dipper and 28 ft. boom as standard equipment. It is being presented as a "sister" shovel of the Marion 93-M Diesel machine. All motions of the new shovel are electrically controlled. The swing machinery is powered by a separate vertical motor, direct geared through two intermediate shafts to the main swing shaft, which is mounted on the upper



Marion 93-M Ward-Leonard All-Electric Shovel

frame structure. The hoist machinery is powered by a separate motor, first through a silent chain reduction to the intermediate shaft, and then through a single gear reduction to the drum shaft. A separate motor direct geared through an intermediate shaft to the shipper shaft supplies power for the crowd machinery. The motor generator set on the Marion 93-M Ward-Leonard consists of an induction driving motor direct connected to three direct current generators in line, and an exciter, all mounted on a self-supporting base. Each generator is of the Ward-Leonard type designed for variable voltage control. The motors themselves are the latest mill type, 600-line, shunt wound, 230-volt, direct current, and possess exceptionally low armature inertia and high over-load capacity. They are designed especially for extreme, fast reversing service.

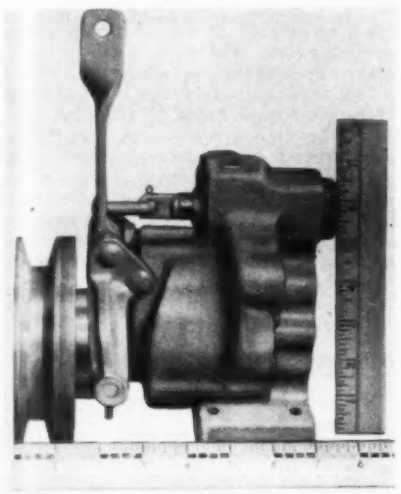
410
Drawing Instrument

A new drawing instrument, the Colmery protractor geometrical Rule AA, made by Plastic Enterprise, Inc., Canton, O., combines an English scale in 16ths, a metric

scale in millimeters, an engineer's scale in 10ths and 20ths, a protractor, 30 and 60 degree triangles, and various geometric shapes, all in one instrument. The rule hooks conveniently into standard three-ring notebooks, either large or medium size. The rule is 8½ in. long, 2½ in. wide, and .060 in. thick. In addition to the features already mentioned, the rule includes a metric-English conversion table, a series of holes at ¼ in. intervals for calibrating lines and for drawing circles up to 8 in. in diameter, and calibrations for drawing isosceles and 30-60-degree equilateral triangles to various sizes.

411
Power Plant

A new, compact, lightweight hydraulic clutch-type power pump put on the market by Hydra-Clutch Pump Division, Waukesha Hydraulic Corp., Dept. 1238, P.O. Box 414, Waukesha, Wis., is especially designed for those applications where hydraulic power is desired for periodic short lengths of time. When the power is required, the clutch is engaged, transmitting the power to the application. The pump operates only



Hydro-Clutch Pump

when power is needed. One simple control (1) engages the clutch, (2) disengages the clutch, and (3) operates the slide valve. The pump contains an overload relief valve. This unit is not hand-pumped. It is stated that road machinery can be quickly converted from manual to hydraulic control with this new pump. On trucks, it is claimed, the pump saves time and labor by actuating dump bodies, lifting tailgates and other miscellaneous operations.

412
Diesel Engine

Production of a new supercharged Cummins diesel engine for industrial applications has been announced by Cummins Engine Co., Inc., Columbus, Ind. The newest addition to the Cummins line is designated Model HRBIS-600 and develops 225 hp at 1800 rpm. Model HRBIS-600 has a 5⅛ in. bore and a 6 in. stroke, with piston displacement of 743 cu. in. Like all Cummins diesels, it employs the four-stroke cycle principle of operation, and the exclusive Cummins fuel distribution and injection system. Other mechanical features include standard two-valve heads, continuous groove main bearings, increased flow lubricating system, buttress-type oil pan and flywheel housing, a newly-designed lubricating oil cooler and a Roots-type blower. Deliveries of the new Cummins diesel began Feb.

Since I got this MICHIGAN, I've been able to handle a lot of the jobs around the country that I had to pass up before. That shovel gets to the job as fast as my trucks, and under its own power. It'll roll through city traffic without any trouble—and I don't have to worry about highway limits. Best of all, it'll pull in and out of any place the trucks can go. Yessir, my MICHIGAN is always ready to go—saves plenty of time too!

I looked 'em all over before I decided on MICHIGAN—and the way it has performed since convinces me that MICHIGAN is 'tops' as a money-maker.

DID YOU KNOW
you can buy
a brand new
MICHIGAN
TRUCK CRANE
complete with chassis
for as little as $10,250
F.O.B. factory?

Write for Bulletin 100, "*On the Job with* MICHIGAN"

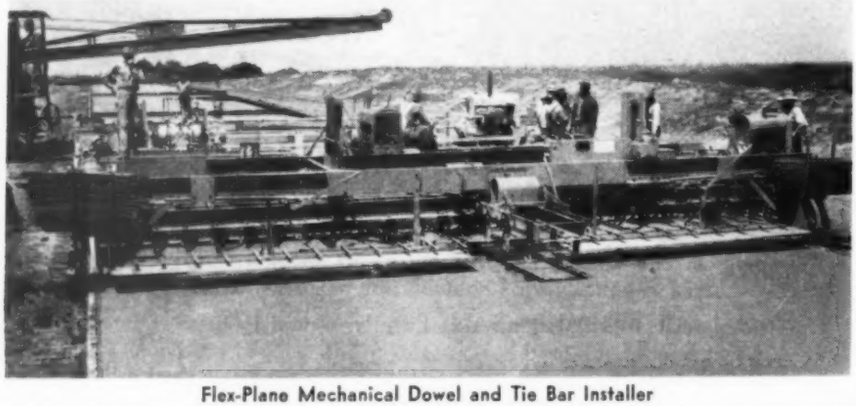
MICHIGAN

MICHIGAN POWER SHOVEL COMPANY
480 SECOND STREET BENTON HARBOR, MICHIGAN

1. In addition to the industrial model, an automotive engine, Model HRBS-600 was placed in production at the same time. Other industrial and marine models will be announced later.

413
Mechanical Dowel Installer

A machine that mechanically installs dowels and tie bars in concrete pavements, thus eliminating dowel holding devices, announced by the Flex-Plane Co., Warren, O., vibrates bars through the finished surface to their exact position and alignment within the slab. The machine is usually placed on the forms behind the finishing machine. It is a gas electric unit, with hydraulic lift controls. Machines are manufactured in two standard widths—adjustable 20 to 25 ft. for full width paving; and 10 to 15 ft. for half width paving. A 20 to 25 ft. machine is usually equipped with the dowel spotter to install transverse bars; and tie bar attachment for installing longitudinal bars; and both transverse and longitudinal joint installing attachments. It is stated that in a 30 second operation, this machine will install dowels and tie bars and cut the transverse and longitudinal joints. A 10 to 15 ft. machine is equipped with dowel spotter and transverse joint attachment only.



Flex-Plane Mechanical Dowel and Tie Bar Installer

414
20 Cu. Yd. Wagon

A new Terra Cobra Wagon Model TC-W14, announced by Woolridge Manufacturing Co., Sunnyvale, Calif., is available complete with 200 hp Terra Cobra Model TC tractor, or as wagon unit Model W14 only, designed for quick interchange with scraper unit on all models of Terra Cobra self-propelled scrapers. With a heaped capacity of 20 cu. yds., and 14 struck, the tapered bottomless hopper spot dumps to rear, or spreads to desired lift by moving back on roller tracks. Positive fore and aft motion of body is effected by air controlled cables reeved without reverse bends in such a manner as never to contact load. Cable is accessible at all times. Hopper, which will pass rock up to 48 in. diameter, and stationary chassis bottom plate are of heavy abrasion resistant alloy steel. The hopper is ruggedly braced on all sides. Massive rear wheel brakes operate from two air reservoirs on wagon, and set automatically if air supply from tractor is interrupted. They may be set by hand from operator's cab. In addition, a disk parking brake is included on the tractor unit.

Model TC-W14 Terra Cobra Wagon

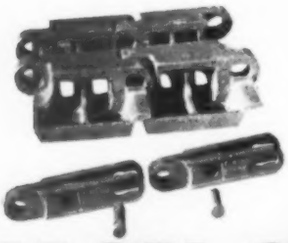
415
Truck-Mounted Crane

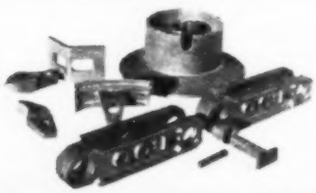
A new ½ yd., 10-ton truck-mounted crane and excavator has been announced by the Wayne Crane Division of American Steel Dredge Co., Fort Wayne 1, Ind. Known as the Model 44 Corsair, the machine travels at truck speeds, swings at 5½ r.p.m., and is convertible to all crane and shovel attachments. The 6-wheel, tandem-type carrier, built especially for crane mounting, is of 16 in., 45 lb. steel I-beam construction. Outrigger tubes are integral with frame—one pair ahead of front wheels and one pair behind rear wheels—to provide maximum rigidity and stability. Improved boom clearance and visibility are achieved by an offset 1-man cab and tapered frame ends. Other carrier features include tandem drive, 8-tire or 10-tire tractors, and a differential lock for heavy, off-the-road work. An auxiliary

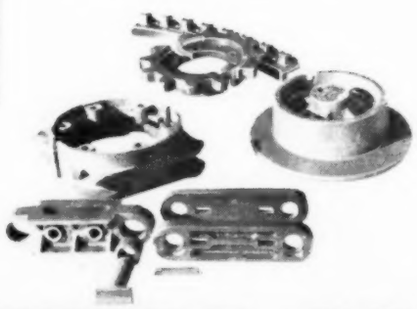
RUGGED, STURDY PERFORMERS

Pacific | WEARING PARTS FOR DITCHING MACHINES

ALLOY STEEL & METALS CO. manufactures an extensive line of wearing parts for most makes of ditching machines. The material used in the manufacture of these parts is of the highest quality, scientifically alloyed to obtain the longest wearing qualities combined with great strength. Pacific Ditching Machine Parts assure long, dependable service. Expensive downtime is reduced to an absolute minimum.







ALLOY STEEL & METALS CO.

1862 EAST 55th STREET • LOS ANGELES 11, CALIFORNIA

Model 44 Corsair Truck Crane

transmission provides ten speeds forward and two reverse. Power is supplied by a 6-cylinder gasoline engine which develops 105 hp at 3200 r.p.m. Comparable diesel engine is optional. Crane features include 20 in. clutches, enclosed gears running in oil and a worm-driven boom hoist. The crane is powered by an 8-cylinder gasoline engine which develops 62 hp at 1800 r.p.m. Diesel engine is optional.

416
Diesel Powered Trucks

Two new diesel-powered trucks, Models KBD-12 and KBRD-14 with GVW ratings of 31,500 lb. and 35,000 lb., respectively, have been announced by International Harvester Co., Chicago, Ill. The KBD-12 is available in four wheelbases, 155, 161, 179 and 215 in. The KBRD-14 model is available with 161, 179 and 215-in. wheelbase. The power plant of these new models is the new HRB-600 Cummins diesel which develops 165 maximum horsepower at 1800 r.p.m. The KBD-12 is available with single or double reduction drive or two-speed rear axles, each available in three axle ratios. The KBRD-14 offers an option of either double-reduction final drive (five ratios) or two-speed rear axle with 6.41 and 8.38 ratios. Standard tires are 11:00—20 with 11:00—22, 11:00—24, 12:00—20 and 12:00—24 as optional. Transmissions of both models are of the five forward speed type with either direct in fifth or overdrive fifth speed. Except in the 155-in. wheelbase chassis, two optional auxiliary transmissions are available to meet operating requirements.

417
Truck Mixer Chassis

A new line of mixer chassis, designed specifically for truck mixers and agitators, has been introduced by the Available Truck Co., 2501 Elston Ave., Chicago 47, Ill. The line comprises four models, one

Truck Mixer Chassis

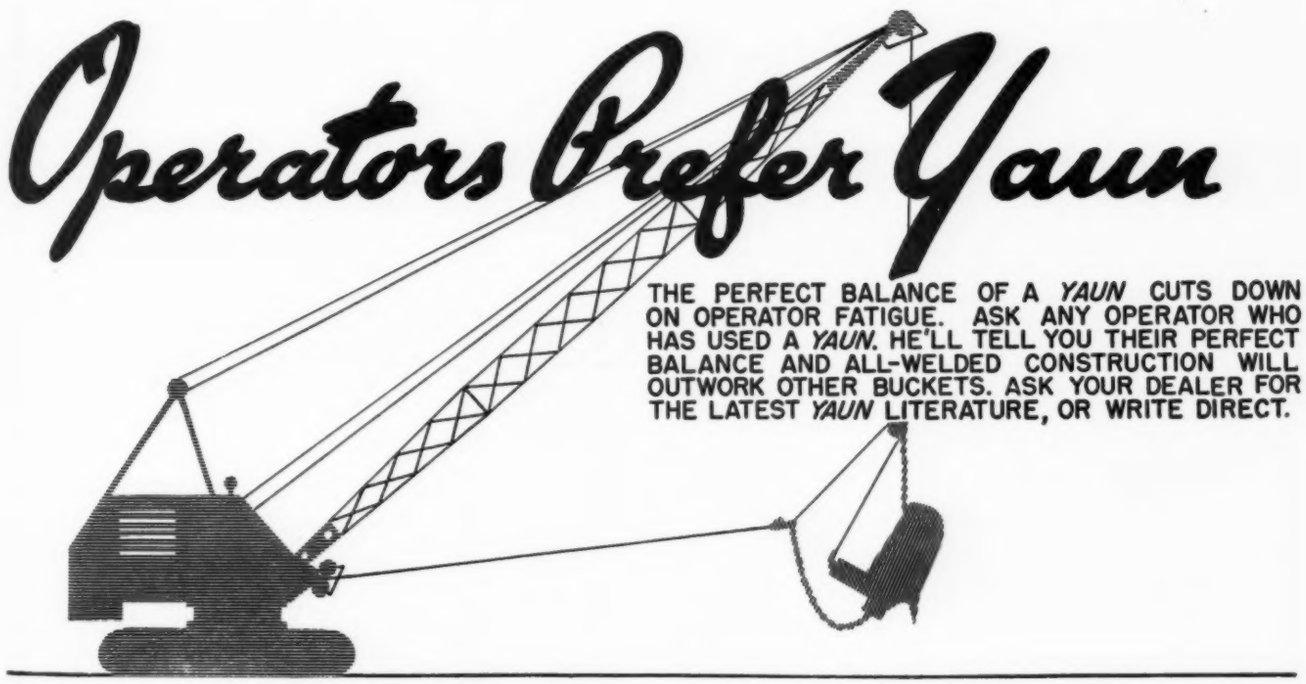
for each size mixer. The following outstanding features are claimed: Exceptional tractive effort which assures the ready-mix operator that the charge will be delivered to even the remotest forms. Cab-over-engine design of all models, including larger two six wheel models, providing minimum turning radius, correct weight distribution, better driver vision. Heavy duty construction throughout this custom-made line enabling severe use off the highway as well as on. Ample highway speed to assure quick return to batch plant. Wheelbases on all models provide for a minimum of 18 in. between back of cab and mixer—assuring easy access to auxiliary engine on mixer at all times. All component parts readily obtainable throughout the country.

418
Hoisting Hooks

BTC drop forged safety hooks have been added to the line BTC hooks of the Brewer-Titchener Corporation, Cortland, N.Y. The new Safety hooks are drop forged for maximum strength and reliability.

Left, 5-ton hook with eye bridge
Center, 10-ton safety hook with eye bridge
Right, 10-ton hook with shank bridge

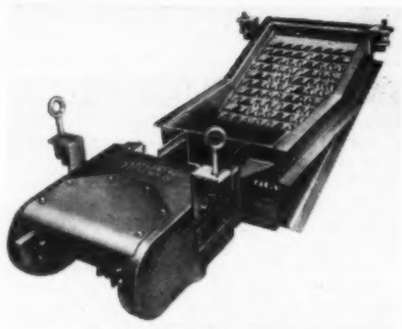
Automatic mousing action with a safety-tie lip lock holds the point of the hook and prevents the sling from slipping off; this tie also adds to the strength of the hook. The safety-tie mousing automatically engages as the load is applied and disengages when the load is released.


Operators Prefer Yaun
THE PERFECT BALANCE OF A YAUN CUTS DOWN ON OPERATOR FATIGUE. ASK ANY OPERATOR WHO HAS USED A YAUN. HE'LL TELL YOU THEIR PERFECT BALANCE AND ALL-WELDED CONSTRUCTION WILL OUTWORK OTHER BUCKETS. ASK YOUR DEALER FOR THE LATEST YAUN LITERATURE, OR WRITE DIRECT.
YAUN
DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.

Another important factor is that the patented shoulder and lip lock construction of the safety-tie gives a wide margin of safety; the pin can be sheared without affecting the load-holding capacity of the hook. All bearing surfaces are machined for accuracy, and the action is simple and positive.

419
Vibrating Screens

A new line of vibrating screens for rough sizing has been announced by Syntron Co. 384 Lexington, Homer City. Pa. They are made up with stepped, punched plates having tapered elongated openings—the size of the latter depending upon material specifications. Single or multiple deck-screen plates are available as desired. The screen area is activated by the Syntron "Vibra-Fow" vibrating



Syntron Vibrating Screen

motor featuring variable control of material flow. This is stated to provide a two-purpose piece of equipment, a vibrating screen and a rheostat controlled vibratory feeder—for increasing the efficiency and capacity of crushers and fine grinders and to prevent damage to belt conveyors by allowing the fines to cushion the lumps.

420
Earthmoving Equipment

Three new units have been added to the line of earthmoving and materials handling equipment of R. G. LeTourneau, Inc., Peoria, Ill. These are the E-35 Tournahopper, the E-40 Tournarocker and the E-25 carryall scraper.

Model E-35 Tournahopper

For bottom-dump hauling, LeTourneau is offering the E-35 Tournahopper, a 27-yard or 35-ton capacity unit which will travel at speeds up to 30 m.p.h. It is powered by a 240 h.p., two-wheel prime mover, and has multiple-disc 4-wheel air brakes which provide 5135 sq. in. of braking surface. The big 10-ft. by 10-ft. Tournahopper bowl presents an easy target for shovel or dragline operator to hit and fill, and enables the Tournahopper to be loaded fast. With positive electric power steer, enabling

Model E-40 Tournarocker

it to make a 90° turn, the Tournahopper is very maneuverable under the shovel and on the fill. When loaded, the Tournahopper has 51% of its weight on the drive tires to give extra traction on grades and in tough going.

The E-40 Tournarocker, a rear dump wagon, is also powered by a 240 h.p. two-wheel prime mover. The E-40 Tournarocker has a 41 cu. yd. capacity and a rear dump which is multi-cable controlled by an electric motor which tips the body beyond vertical position for fast dumping. Drive wheels are up front where they can pull the rig forward quickly in an emergency. Four-wheel disc type air brakes with 5135 sq. in. of braking area give safe control. The E-40 Tournarocker can make a 90° turn, and can take in an 18-ft. radius. It is easy to spot fast at shovel or dragline, its 16-ft. 8 in. by 10-ft. body providing a big target for fast and accurate loading. Only 12-ft. high, the Tournarocker has a low center of gravity which in-

Model E-25 Scraper with Model B Tournapull

NO TIME LOST!
LOADING OR LAYING ITS LOAD

A STANDARD STEEL PRESSURE DISTRIBUTOR GIVES EQUAL CIRCULATION THROUGHOUT THE SPRAY BAR FOR A UNIFORM SURFACE FROM CURB TO CURB FOR LONGER WEAR

STANDARD STEEL
PRESSURE DISTRIBUTOR

The Model 424 can be loaded in quick time for a "fast getaway". A two-way cleaning system guarantees a clean spray bar at the end of the day. First, the material is sucked out of the bar and back into the tank. Then by turning one small valve, cleaning solvent is released into pump and spray bar (without contaminating the asphalt in the tank). No time lost in tinkering — no time lost in loading — Standard Steel 424 keeps going all day long far ahead of the "gravel gang"

WRITE FOR CATALOG 424

OTHER PRODUCTS OF STANDARD STEEL

Maintenance Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.

Built to the Highest Standard

Standard Steel Works NORTH KANSAS CITY, MO.

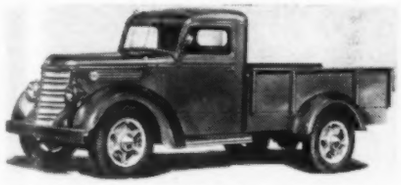
creases operating safety.

The E-25 carryall scraper, also is powered by the 240 h.p., two-wheel prime mover. Being supplied because of contractor demand, this Tournapull-scraper possesses all the design features associated with the new line of LeTourneau equipment—fingertip electric control, positive power steer, Tournamatic differential, more flotation and sure-footed traction.

Of added interest in connection with these new units is that all three—the E-35 Tournahopper, the E-40 Tournarocker and the E-25 carryall scraper—are interchangeable with the same 240 h.p. two-wheel prime mover.

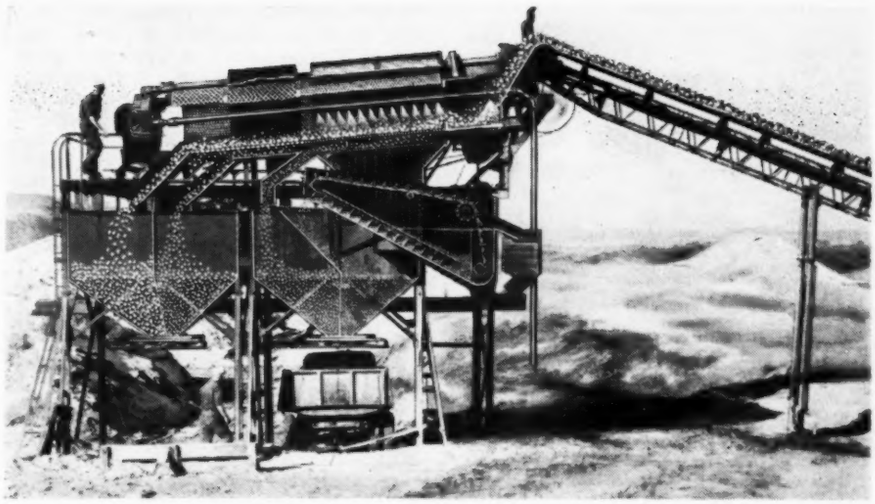
421
Truck

A new ¾ to 2 ton Model 15 M truck has been added to the line of Federal Motor Truck Co., Detroit, Mich. Gross vehicle weight for this truck ranges from 12,000 to 14,500 lbs. depending upon tire size. The gross combination weight of the model 15M with dual rear tires is 28,000 lbs. Available in five wheelbase lengths: 135 in., 146 in., 167 in., 180 in., and 194 in.,



Model 15M Utility Express Truck

the 15M expands the Federal line to a total of 43 models varying in size from ¾ to 35 tons capacity and providing more than 375 combinations with both gasoline and diesel power. A 6-cylinder Hercules engine with a 245 cu. in. displacement provides power for the new Model 15 unit. It has a seven main bearing, counter weighted and statically balanced crankshaft, removable precision copper-lead main and connecting rod bearings. The engine develops 93 hp. at 3400 rpm and 184 lbs. ft. torque at 1400 rpm. Standard equipment also includes an 11 in. clutch with 131.4 sq. in. of lining area which is unusually large for a truck of this size.



Flow of material through 305-W Aggregate Washing Plant

422
Aggregate Washing Plant

The illustration shows the flow of material through the completely redesigned 305-W aggregate washing plant of Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn. The plant produces three sizes of rock and two of sand and has a capacity of 50 to 75 yd. per hour. It uses only 300 to 500 gal. of water per hour, and requires only 35 H.P. for operation. The plant is semi-portable and is simply designed from standard units and includes all framework, spouts and chutes. It is equipped with a mechanical feeder. The plant requires only one man operation.

423
Electric Shovel

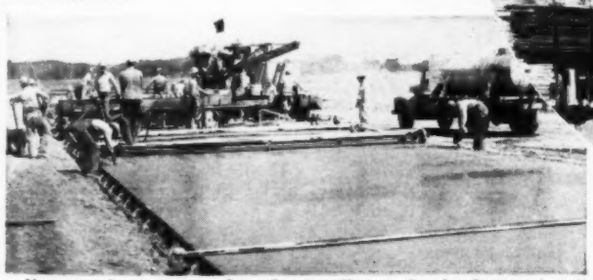
A Ward-Leonard all-electric machine has been added to the line of excavating equipment of the Marion Power Shovel

Mechanical Dowel AND TIE-BAR INSTALLER

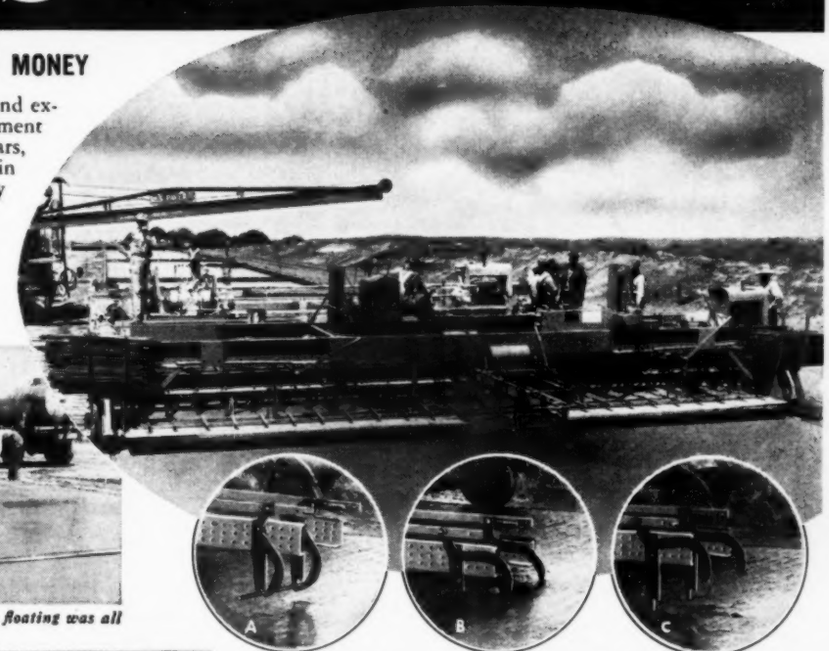
AIRPORT CONTRACTORS—SAVE TIME AND MONEY

You eliminate stakes, complicated holding harness and expensive hand labor, and are assured of perfect alignment with this Flex-Plane installer. Job tested for three years, this machine has demonstrated substantial savings in time and money. Let us tell you how—write today to Flex-Plane, Warren, Ohio, for Bulletin J-105.

- ADJUSTABLE TO VARIOUS DOWEL SPACINGS
- ADJUSTABLE TO VARIOUS PAVEMENT WIDTHS
- INSTALLS IN EXACT POSITION AND ALIGNMENT
- CUTS JOINTS



Note smooth pavement surface after installation. Regular floating was all that was required.

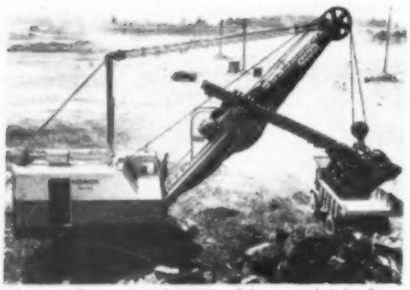


A. Bar gripped by mechanical fingers ready for vibrated insertion into plastic concrete. Tie-bars and dowels easily insert into fingers.

B. Bar has been worked, by vibration, to pre-determined depth. Rear holding finger was disengaged as bar started through concrete.

C. Completed operation. Vibrated removal of fingers assures complete seal of plastic concrete. Surface disturbance is minor.

FLEX-PLANE
WARREN OHIO
(FLEXIBLE ROAD JOINT MACHINE COMPANY)



Marion Type 111-M Ward-Leonard Machine

Co., Marion, Ohio. This 111-M Ward-Leonard shovel is designed for heavy-duty service in the coal, quarry, metal mining and construction industries. As a standard ¾ shovel, the machine is equipped with a 3½ cu. yd. dipper and 33 ft. boom, while for coal loading service, the dipper capacity is 6 cu. yd. The 111-M Ward-Leonard is presented as a "sister" shovel of the 111-M Diesel machine, which was introduced into the medium-size excavator class almost three years ago. Outstanding distinguishing feature of the Marion 111-M Ward-Leonard machine is the fact that all motions are electrically controlled. Control of the various motor speeds and direction of rotation is obtained by the use of the Ward-Leonard system of generator voltage control. The motor generator set on the 111-M consists of an induction motor direct connected to three direct current generators, and an exciter, all mounted on a self-supporting sub-base. Each generator is of the Ward-Leonard type designed for variable voltage control; one supplies power for the hoist motor, one for the swing and propel motor, and one for the crowd motor. Newly designed, shunt wound, 230-volt, direct current mill type motors have exceptionally low armature inertia, high overload capacity, and are designed especially for extreme reversing service. The hoist motor is equipped with roller bearings and is force ventilated. The swing and propel motor is of the vertical type with ball bearings. The crowd motor, which is of the horizontal type with roller bearings, is bolted to a base which is welded to and forms an integral part of the shovel boom. Other features claimed for the Marion 111-M Ward-Leonard machine include: Simplified machinery design and construction—heat treated, machine cut gears, shafts of alloy steel; all-welded construction; "Stiff Leg" Gantry; all-welded box section boom made from formed plates having rounded corners for greater strength; conveniently arranged and simply designed operating control equipment.

Loads
3 to 5 Y.P.M.*

Soon Pays for Itself in Time and Money Saved!

- From job to job at truck speed.
- Handles ANY loose material quickly and economically — coal, snow, dirt, gravel, cinders, etc.
- One-man operation.

* Yards Per Minute

Send for Bulletin CE-9-847

EAGLE
JAW CRUSHERS · IMPACT BREAKERS
PULVERIZERS · CONVEYORS · LOADERS
CRUSHER CO., Inc. GALION OHIO·U·S·A

424
Oil Testing Kit

An oil inspection kit, claimed to provide quick and simple means for determining with accuracy the actual condition of lubricating oil, has been brought out by The Gerin Corporation, Red Bank, N.J. It is stated that with this equipment any workman can test four samples of oil in 25 minutes—eight samples in 40 minutes.

Gerin Kit for Oil Inspection

The kit provides positive measurements of the four dangerous classes of contaminants to show: Amount of asphalt and other gummy, deposit-forming materials. Change in viscosity due to fuel dilution and other causes. Amount of dirt, metal particles, other sediment and water. Whether acidity has become excessive.

425
Electric Paving Breaker

A paving breaker announced by the Homelite Corporation, Port Chester, N.Y., is operated by electricity rather than by compressed air. Electricity to operate this breaker is supplied by a 129-lb. dual-voltage gasoline-engine-driven generator, which can be used for operating other

Electric Paving Breaker

types of high-cycle tools as well as standard 110-volt tools and floodights. Both breaker and generator make a compact combination that can fit in the trunk of a car and can be put into operation quickly by one man. Also, it is stated that this new breaker is unaffected by dust or abrasive particles. The motor has no brushes or commutator to wear out. There is no electrical connection between rotor and stator and sealed ball bearings support the rotor shaft. A floating cylinder prevents the transmission of shock to the driving mechanism. Moreover, a positive plunger pump lubricator has an automatic switch which stops the breaker when its oil reservoir is empty and a smooth, flat-sided back rides comfortably on the operator's leg and makes the breaker easier to move and operate.

426
Portable Concrete Plant

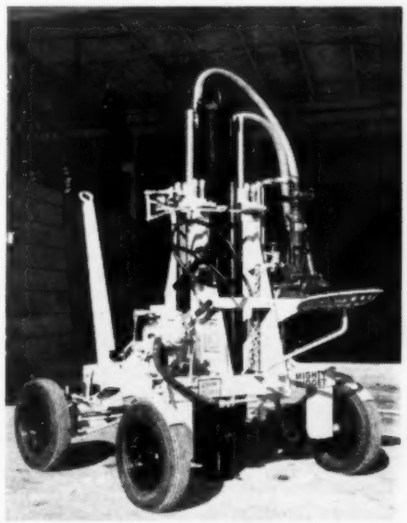
An auxiliary hoist, hydraulically operated by the plant operator, has been added to the portable concrete plant of the Erie Steel Construction Co., Erie, Pa. The hoist raises and lowers a concrete bucket which takes a complete batch of concrete from the Erie plant, thus permitting the next batch to be cycled with little delay. It is conservatively estimated that with this hoist concrete output is increased at least 25%

Erie Strayer Portable Concrete Plant with Auxiliary Hoist and Adjustable Swing Chute

in the Erie Plant. Another advantage resulting is the ability to raise each batch of concrete to any desired height. A swivel chute operating through 180° arc adds flexibility to the discharge point. It will now be possible to load transit mix trucks, special body concrete trucks and to reach high form work.

427
Pavement Breaker

New features incorporated in the Mighty Midget pavement breaker of the Rapid Pavement Breaker Corporation, 2751 East 11th St., Los Angeles, Calif.,



Improved Mighty Midget Pavement Breaker

are claimed to permit greater ease of handling and to produce important gains in yardage of concrete broken. All controls are within easy reach of the operator's seat which is placed directly behind the machine, allowing the operator to see exactly where and how the hammer contacts the pavement at all times. A conventional steering wheel has been

LIGHTER

STRONGER

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Williams Type BUCKETS

Stronger because they're constructed of **welded rolled steel**... *lighter* because non-essential weight has been eliminated. Wellman buckets meet every requirement of heavy service with longer life and lower cost! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service. ⅜ to 16½ yd. capacity.

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THE WELLMAN ENGINEERING COMPANY

7003 CENTRAL AVENUE CLEVELAND 4, OHIO

added which fits alongside the machine and is readily reached. Worm drive tends to hold the front wheel much steadier under difficult conditions. New higher wheels allow the machine to run through broken concrete and remain on a straight course, without sinking into the concrete.

428

Wire Rope Slings

A new addition to the line of ACCO registered wire rope slings recently announced by the American Chain & Cable Co., Inc., Wilkes-Barre, Pa., is the SW-42 cable-laid grommet with double ACCO-LOC splices. Made entirely of preformed improved plow steel wires, the Cable-Laid Grommet is stated to give flexibility comparable to manila rope and complete freedom from crankiness. It can be used in the same types of hitches as manila rope. The high strength of the all-steel construction

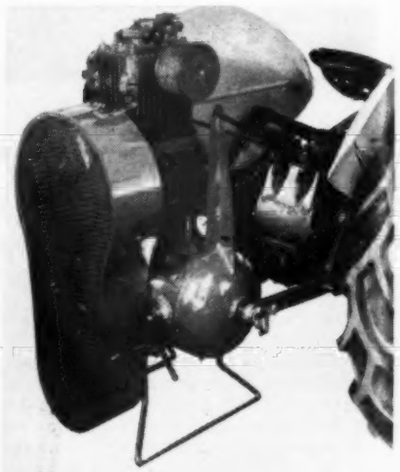
SW-42 Cable-Laid Grommet

permits use of smaller diameters than would be necessary with fibre ropes and provides a high safety factor of 5 to 1. The ACCO registered cable-laid grommet is furnished in diameters from 9/32 in. to 1½ in. with rated capacities up to 53 tons in basket hitch. Capacities and dimensions are shown in the SW-4 ACCO Registered Wire Rope Sling Catalog available on request.

429

Tractor-Attached Air Compressor

Two new air-compressor units for direct attachment through universal joint couplings to tractor power-take-offs have been announced by Miller-Robinson Co., 7007 Avalon Blvd., Los Angeles, Calif. The new units, identified as Models PTO-3F



Tractor-Attached Air Compressor

and PTO-5F, with displacements of 17 c.f.m. and 30 c.f.m. respectively, have been extensively tested in field service and are now in production and available for immediate delivery. They can be attached to the regular linkage of Ford and Ferguson tractors and hydraulically equipped Jeeps, and are easily adapted to other makes by use of simple brackets.

430

Single Drum Winch

A new single drum winch, known as the HySpeed Winch, has been announced by the Hyster Co., Portland 8, Ore., for use with "Caterpillar" D6, D7, D8, and DW10 diesel tractors. Light-weight, high-speed, and friction-driven, the winch is primarily designed for efficient logging over rough ground where a large size tractor is needed, yet where the wood is small. Planetary gearing in the unit is designed

Hyster HySpeed Winch

Model Illustrated: DF-70, 7 cu. yd. body designed to haul bulky materials, and where maximum inside width is necessary, to keep height of load at minimum. Unit illustrated is over Marion HD-8A double arm lift hoist.

Profitable Hauling Starts with "On The Job" Design

It's easier to meet the profit problems of your hauling job with Marion. Because Marion units are developed by engineers who go out "on the job" under actual working conditions . . . they are designed for bigger payloads with fewer breakdowns under the roughest treatment. Ask your Marion Distributor about the Marion unit designed "on the job" to meet your special requirements, or write direct.

MARION
DUMP BODIES and HYDRAULIC HOISTS

GET MORE DETAILS NOW
Just mail a post card or letter for the complete Marion catalog, or ask your Marion Distributor.

MARION METAL PRODUCTS CO., MARION, OHIO

in such a manner that when clutch and brake are released, the drum tends to free spool the cable. Standard controls on all four tractors are a two-lever hydraulic system. Optional single lever mechanical controls synchronizing clutch and brake action are available for all except the DW10. The unit can be used for cable controlled bulldozer operation because of the interlocked clutch and brake mechanism. The HySpeed winch in addition to its logging use may be employed in a number of industrial applications. The design is such that it will fit well into stiff-legged crane boom designs.

431
Portable Crushing Plant

A low cost portable crushing plant, the Model TS16, added to the line of Universal Engineering Corporation, Cedar Rapids, Iowa, a division of Pettibone Mulliken Corp., is specifically designed for small jobs where specifications are not too rigid, and where more expensive plants are impractical. Gravel is delivered to the hopper over a mechanical feeder and then to the screen where the over-size is removed and passed to the crusher. The fines passing through the screen are delivered by chute to the loading conveyor. As the over-size is crushed, it, too, goes to the delivery conveyor and is not returned to the

Model TS 16 Crushing Plant

screen for grading. The crusher is of a design that makes it possible to reduce the over-size to minus 1 in. if desired. The plant consists of a bar grate which rejects boulders too large for the crusher; clutch controlled reciprocrating feeder; a 2 ft. x 3 ft. roller bearing gyrating screen mounted at an incline between the feeder and crusher; a by pass chute built under the screen which delivers fine material to the loading conveyor; a 10 ft. x 16 ft. Universal roller bearing overhead eccentric force feed crusher; an 18 in. x 20 ft. delivery conveyor, equipped with anti-friction sealed for life bearings in troughing rolls and return idlers and self-cleaning tail pulley; a steel gooseneck truck with roller-bearing wheels and pneumatic tires; 35 to 40 h.p. gasoline or diesel power of any standard make. The capacity of Model TS 16 Plant is 30 to 60 tons per hour, depending upon the amount of crushing required and the size to which the over-size must be crushed. The plant is controlled from the special platform from which the operator has full view of the entire plant.

MANUFACTURERS' LITERATURE

432
Conveyor Belting

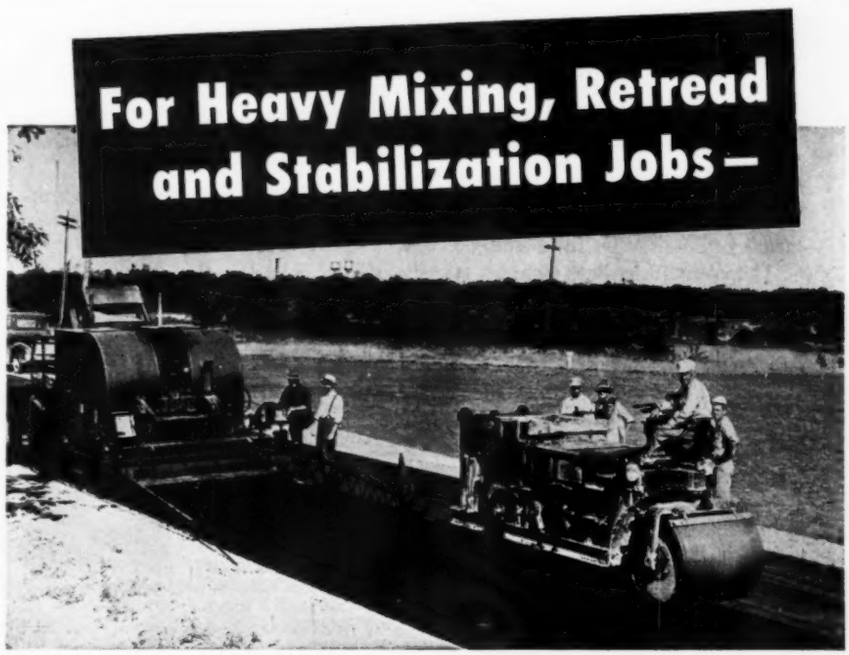
A new 24-page manual on its 1949 line of conveyor and elevator belting published by New York Belting & Packing Co., Passaic, N.J., contains descriptions of the engineering characteristics of all types of belts manufactured by the company. The manual includes data on carrying capacities, approximate belt weights, selection and application of elevator belts, and construction of all types of belts in the line.

433
Welded Bridges

Availability of a new reprint entitled "Welded Bridges" has been announced by Air Reduction Sales Co., 60 East 42nd St., New York 17, N.Y. This reprint originally appeared in article form in The Welding Journal and was written by LaMotte Grover, Airco Welding Engineer. The 16 pages of this reprint offer a review of welded bridges constructed in the U.S.A., Canada and various foreign countries during the last 12 years and of practices in specifying steel material, details of design and methods of construction. Also included is a review of the results of some German fatigue tests of welded beams, fatigue fractures in girders and stringers of riveted railway bridges and the repairs that are made by welding. Eighteen photographs, two diagrams and four tables augment the article itself.

434
Cleaning and Sealing Joints

Equipment for cleaning and sealing joints in concrete pavements is illustrated and described in a folder issued by The Joint Equipment Co., P.O. Box 67, Bronxville, N.Y. Equipment featured in the circular include: A powered machine for removing all loose dirt and sealing compound from joints and cracks; a double boiler unit for heating rubber asphalt joint sealing compounds; and a push type unit for applying the compound to joints.



The New Heavy-Duty Moto-Paver

Although developed primarily to meet the rugged conditions of hilly and mountainous terrain, the heavy duty Moto-Paver is proving equally efficient under widely differing conditions in other sections of the country.

Wherever you have a heavy bituminous mixing, retread or stabilization job, it will pay you to investigate this new and more powerful Moto-Paver. It does the *complete mixing* and *laying job—in one continuous operation.* See your local distributor or write direct for specifications and complete information.

The Moto-Paver is a very flexible as well as a mobile unit. The illustration shows it being used as a stationary mixing plant.

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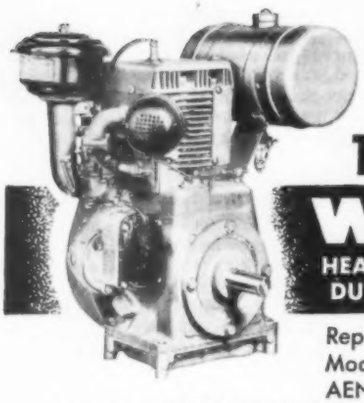


20% Increase in H. P.
15% Decrease in weight
That's the *New* MODEL AEN

WISCONSIN
HEAVY-DUTY *Air-Cooled* **ENGINE!**

Replacing the universally popular Wisconsin Model AEH Air-Cooled Engine, the new Model AEN turns up 7.5 H.P. at 3,000 R.P.M. as against 6.1 H.P. at 3,200 R.P.M. delivered by the engine it replaces. Weight: 110 lbs., as against 130 lbs. for the AEH.

All this has been accomplished without sacrificing heavy-duty crankshaft capacity or any of the traditional Wisconsin features such as: Tapered roller bearings at *both* ends of the drop-forged crankshaft; oil pump and spray lubrication; weather-sealed high tension outside magneto with impulse coupling for quick starting and dependable ignition in any climate, in any weather; flywheel-fan air-cooling — extremely efficient at all temperatures from sub-zero to 140°F.

The Model AEN represents a major achievement in the design and construction of a light weight heavy-duty power unit for all-purpose power applications. Write for Bulletin S-109.

The Wisconsin line includes 4-cycle single cylinder, 2- and 4-cylinder models in a complete power range from 2 to 30 H.P.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 14, WISCONSIN

PORTABLE ASPHALT PLANTS
High Production—Low Cost

THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE In a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan Illustrated CATALOG today.

TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY, MASS.

435
Wire Rope Slings

A new bulletin describing its flat-laced wire rope slings, introduced early in 1948, has been issued by A. Leschen & Sons Rope Co., 5909 Kearney Ave., St. Louis 12, Mo. The bulletin contains illustrations of many actual installations, in a wide field of operation and of loads in various sizes, shapes and weights. Details of design, advantages and applications are given.

436
Motor Grader

Many features and attachments of its new No. 8 motor grader are described in a catalog issued by American Road Equipment Co., 2319 No. 18th St., Omaha 10, Neb. Illustrations show the grader engaged in many operations in connection with highway construction and maintenance. Front end attachments are illustrated and described. Specifications for the grader are included.

437
Street Flushing Equipment

Street flushing and cleaning equipment is featured in a new 8-page bulletin issued by Rosco Manufacturing Co., 3118 S. Snelling Ave., Minneapolis 6, Minn. The bulletin stresses the prominent features of the Model MTA streamlined street flusher and includes photographs of units now in use. Complete specifications of the standard model, which is built in 1200, 1600 and 2100 gal. capacities, together with truck mounting sketch, weight and measurement data are also included. Illustrations with full description of available auxiliary or optional attachments for the street flusher are shown. The bulletin also features two other machines with complete specification data and photographs of each unit. These include a 1000 gal. capacity, 2-wheel type flusher and a street cleaner, power driven, that features a water blanket spray in front of the brush.

438
New C Tournapull

Information on the new electric-control C Tournapull is given in a new broadside, TP-167, released by R. G. LeTourneau, Inc., Peoria, Ill. In addition to presenting specifications on this 150 hp. 16-ton capacity rig, the broadside features action pictures showing this Tournapull working in mud, in tough sand, on steep grades, and making job-to-job moves over the highway. The new literature piece also describes main design features of this rig.

439
Wire Rope and Chain Fittings

A new catalog of industrial and marine fittings announced by The Thomas Laughlin Co., Portland, Me., lists a complete line of drop-forged wire rope and chain fittings. New fittings, new data, new helpful tables and charts, including several strength and dimension tables, are included to help engineers, designers, builders and riggers to select the proper combination of fittings for any industrial job. List prices are given for all items.

440
Aggregate Batching Plant

A new 12-page bulletin on portable aggregate batching plants for road builders has been announced by The Heltzel Steel Form and Iron Co., Warren, O. Heltzel portable Type 1 bins, ranging in capacity from 52-72-85-100 tons, are thoroughly described. Batchers for these bins include the 1¼ cu. yd. Universal batcher for both batch truck and truck mixer operations; the 2 cu. yd. truck mixer batcher; and 2½ cu. yd. dual aggregate batcher for batch truck operations. The dual aggregate batcher will simultaneously load two compartments of a batch truck. Foundation and erection details and complete specifications are included in the new bulletin. Arrangements for loading the bins by clam shell, ramp or conveyor are pictured.

FLINK SPREADERS

Unquestionably the finest hydraulic spreader.

Hundreds more transportation companies, cities and counties are using Flink Spreaders to spread granulars in ice control and highway maintenance work. Spread forward or backing up, full or half width of street. Controlled from cab. Write for literature.

FLINK CO. Dept. S-10 Streator, Ill.

With the Manufacturers

(*Continued from page* 96)

Co., 17560 Chicago Ave., Lansing, Ill., for the northern half of Indiana (with the exception of Lake, LaPorte, and Porter Counties).

Peters Joins Blaw-Knox

H. C. Peters

H. C. Peters has been appointed technical consultant of construction equipment of the Blaw-Knox Division of Blaw-Knox Co., Pittsburgh, Pa. Mr. Peters has had 25 years experience in the development and marketing of construction machinery. For 14 years he was employed in various sales and technical capacities by T. L. Smith Co. of Milwaukee, his last position being vice president in charge of engineering, development and patents. He served the Ransome Concrete Machinery Co., of Dunellen, N.J., for a number of years as branch and territory manager; and for a brief period was employed by Hunter Machinery Co., Milwaukee.

Hill Made Vice President

E. B. Hill

Edward B. Hill, formerly general sales manager, has been appointed vice president in charge of sales for Gar Wood Industries, Inc., Wayne, Mich. Mr. Hill is one of the oldest employees of the company, having started with the old Wood Hydraulic Hoist and Body Co., predecessors to Gar Wood Industries, Inc., on Feb. 1, 1926, as a mechanic helper, and has since worked his way up through the branch and field organization. He was appointed general sales manager in 1947.

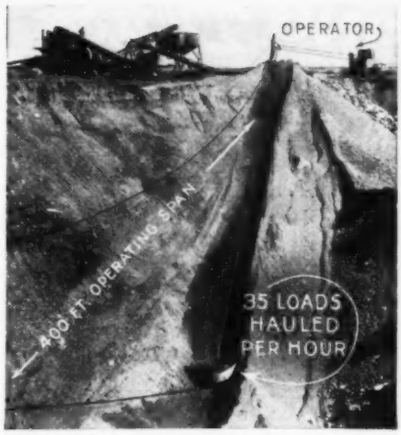
Giles Named Sales Manager

Henry Giles

Henry Giles, former road machinery sales representative at The Heil Co.'s Hillside, N.J., plant, has been appointed sales manager of its road machinery division with headquarters at Milwaukee, Wis. He succeeds Dan Pierce, who has resigned to become sales manager for State Equipment Co., Heil road machinery distributor at Harrisburg, Pa. No newcomer to the construction equipment field, Giles sold tractors before the war, served with Army Ordnance during the war, and joined The Heil Co. early in 1946.

New Koehring Distributor

The Mitchell Distributing Co., Spruce Spring and Raleigh, N.C., has been appointed distributor for the entire state of North Carolina for the Koehring Co., Mil-



★ The above picture of a small Sauerman Scraper digging gravel from pit and delivering to crushing plant shows the simple effectiveness of this method. This Sauerman machine uses 4½ gals. of gasoline to move 45 cu. yd. of material per hour.

YOU CAN SAVE

with

POWER SCRAPERS and CABLEWAYS

SAVINGS in equipment cost, time and labor are your direct gains on dig-and-haul jobs with a Sauerman Scraper or Cableway.

ONE-MAN CONTROL, fast and positive action. Reaches across a river, pond, pit or stockpile, or to top of hill—moves material from any point within cable radius, and dumps automatically wherever desired.

Whether you handle a few tons a day, or many thousand tons, we can supply size and type of equipment that will meet your exact requirements economically. It will be built to give you years of service and require little by way of repairs.

SAUERMAN BROS., INC.

588 S. Clinton Street Chicago 7, Illinois

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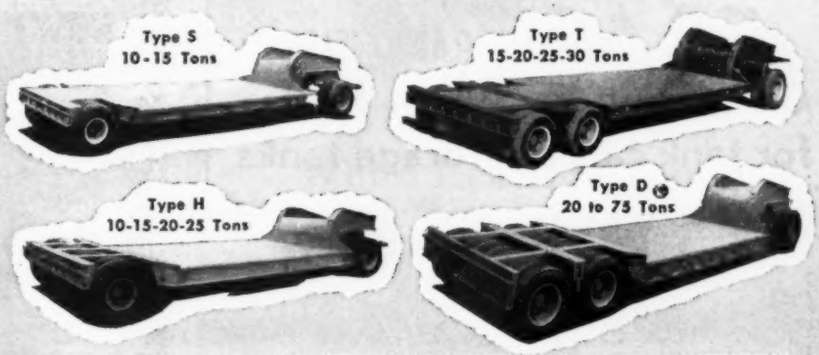
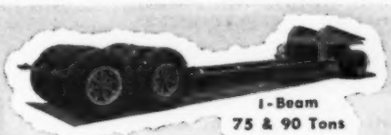
5 BASIC TYPES of ROGERS TRAILERS



• Choose the one that most nearly meets your needs and ideas. We'll develop a trailer "tailored" to conform to your ideas, adapted particularly to your tractor and efficiently designed to your specific kind of hauling.



ROGERS BROTHERS CORPORATION

DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS SINCE 1915

110 Orchard St. Albion, Pa.

CLOSING POWER *Plus* WHEN AN OWEN BUCKET *Clamps Down*

It's the "Plus" features in a product that contribute largely to outstanding performance and build user satisfaction and profits.

Relax and swing an Owen from your boom. Closing Power PLUS is there when required for licking the toughest excavating jobs which will confront you.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

A MOUTHFUL AT EVERY BITE

THE OWEN BUCKET CO. 6070 Breakwater Ave., Cleveland, O.

BRANCHES: PHILADELPHIA • CHICAGO • BERKELEY, CALIF.

waukee, Wis. They will handle the complete Koehring line of heavy-duty construction equipment along with products of the three Koehring subsidiaries, C. S. Johnson, Kwik-Mix and Parsons.

New Vice President Marlow Pumps

V. Vandervoort

Vincent Vandervoort has been elected vice president of Marlow Pumps, Ridgewood, N. J. A widely known New Jersey industrialist and banker, Mr. Vandervoort has been affiliated with the Marlow concern since 1947. In addition to his position with Marlow Pumps, Mr. Vandervoort is vice president of the Paterson Savings and Trust Co. and president of the Alexander Hamilton Hotel Corporation, both of Paterson.

Hoover Commission Would Place P. R. A. Under Commerce

The Hoover commission on government reorganization has rejected proposals for a separate Cabinet department for transportation, and instead has recommended that the Public Roads Administration and certain other transportation functions be placed under the Commerce Department.

The vehicle safety work of the Interstate Commerce Commission would be transferred to Commerce, and the Office of Defense Transportation would also be continued and placed in Commerce.

In seeking to put transportation largely under one roof at the Commerce Department, the Hoover commission excepted the regulatory work of the I.C.C. and that of the Maritime Commission and the Civil Aeronautics Board, part of whose present work would be placed under Commerce.

The commission said that under the

PACKAGED HEAT

More square feet of heating surface means longer flue life in the

GRACE RAPID FIRE

Circulating & Steam heater for tank cars or storage tanks

The two units are mounted on one chassis, suitable for truck mounting.

Steamer thaws one car while circulator is heating and unloading another.

Write now for complete information.

W. E. GRACE MFG. CO.

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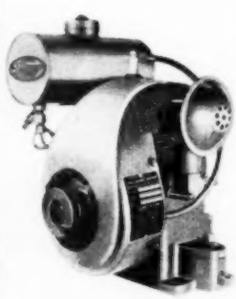


- Here's that famous Lauson dependability — now available in an engine weighing only 23 lbs!
- ¾ H. P. — dependable power for pumping, vibrating and other construction jobs. 4-Cycle, Air-Cooled. Other models to 5 H. P.
- Instant starting — economical operation.
- Machined mounting pad on crankcase for direct mounting of pumps, generators, etc.
- Backed by over 50 years engine-building experience.

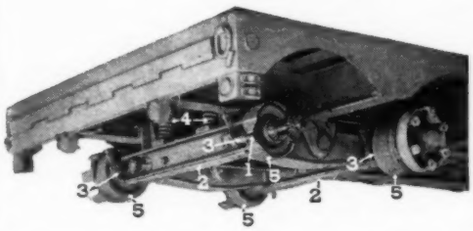
• Nation-wide Lauson service available everywhere!

Dept. RS, The LAUSON Company, New Holstein, Wis.

A Division of Hart-Carter Company
In Canada: Hart-Emerson, Ltd., Winnipeg, Canada

BE SURE YOUR NEXT TRAILER HAS ALL THESE FEATURES.

Deep, wide flange main beams running the full length of the trailer, I-Beam sections for cross-members and outriggers, improved, fabricated gooseneck, and *all* electric-welded construction. Look at all the other features found only on Jahn tandem axles: (1) constant lift cam, (2) two full-width axles attached to longitudinal rocker beams, (3) worm gear type slack adjusters at each wheel, (4) heavy coil springs at each axle and (5) positive equalizing braking at each wheel regardless of position of axle.



JAHN TRAILERS ALL OVER the WORLD!

C. R. JAHN COMPANY

Dept. 45

1106 W. 35th St. Chicago 9, Illinois

Heavy duty trailers from 5 to 100 tons.

existing system the government's transportation activities, employing 89,000 Federal workers are scattered over many separate agencies with consequent waste and overlap, "and policies or programs cannot be considered for transportation as a whole." It said transportation planning for national defense is inadequately centralized, and added:

"A close grouping of the major transportation agencies is essential to the development of intelligent, total transportation policy, and to the efficient administration of transportation activities."

It said the Commerce Department's proposed transportation service should study, among other things, (1) priority of transportation needs and methods of defraying the cost of meeting these needs, and (2) the most advantageous route patterns for extension of transportation services. "Provision of new services in any given case should be weighed against all types of transportation service already provided as, for example, a proposed new air route should be weighed not only against other air routes but against all other types of transportation."

Two major railroad functions would be transferred to Commerce—that of formulating "railroad consolidation plans" and that of dealing with car service and safety.

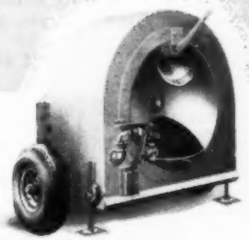
All of the Hoover Commission proposals await Congressional consideration.

●

Night Fatality Rates Maintain Lead Over Daytime Rates—Recently published figures on night traffic accidents and fatalities during 1947, the latest year available, show that the "dark hours" continue to hold the greatest danger for pedestrians and motorists.

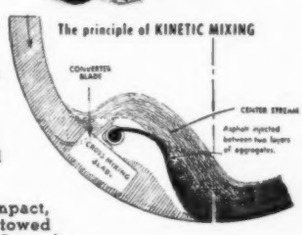
In 1947, deaths from nighttime accidents numbered 18,400, or 57% of the total number of accidents. Of these fatalities, 7,300 occurred in the urban areas and 11,100 in the rural areas.

EIGHT TO TEN BATCHES ... more per barrel of Asphalt!



HERE is an unusual mixing principle in an asphalt mixer that assures maximum coating of aggregate with the minimum of asphalt.

The action of the converter blade and cross mixing blades sets up a mulling action and forces the faster moving materials through the slow ones. In addition the asphalt is introduced *under pressure* into the middle and within the aggregate stream. This unusual mixing action means a better mix and material savings in asphalt.



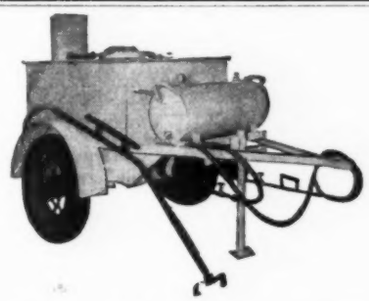
The Kinetic Asphalt Mixer is a compact, fully portable unit that can be towed behind car or truck. It delivers 3 cu. ft. of mix in 30 seconds and will handle either hot or cold mixes. Ask for folder K-100 which gives full details on mixing principle and design.

the FOOTE Kinetic mixer

THE FOOTE CO., INC.

Subsidiary of Blaw-Knox Co.

1936 STATE STREET, NUNDA, NEW YORK



White Heating Kettles Have Fire-Proof Tops

Cut-back and other highly inflammable material used in street and road repairs can be heated with full safety in White kettles. FIRE-PROOF top reduces fire hazard. White asphalt and tar kettles are extensively used. They are highly satisfactory and give long life.

Furnished as plain kettles, or with hand or engine-driven spray pumps for patching all kinds of pavement. Can be supplied with thermometer, barrel hoist, warming hood. All oil burning. Mounted on semi-elliptic springs and pneumatic tires. 65, 110, 165, 220, 300 gallon capacities. Detachable fuel tanks.

Model F-10 is oil jacketed for safely heating elastic joint and crack filler.

Write for Catalog

Elkhart White Mfg. Co. Indiana

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CLEVELAND

NEW

VISIT THE HOLLENDEN...

COMPLETELY REDECORATED

★ 1000 rooms with bath

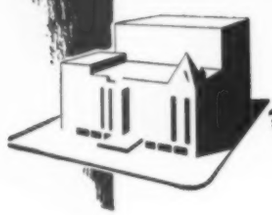
★ Radio in every room

★ Six fine restaurants

★ Central downtown location

★ Garage attached

HOTEL HOLLENDEN



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Check items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

Check products below on which you wish us to obtain information for you:

I AGGREGATE:
1 Bins and Hoppers
2 Conveyors
3 Crushers
4 Portable Plants
5 Screens

II BITUMINOUS:
6 Batchers
7 Finishers
8 Distributors
9 Dryers
10 Heaters
11 Plants (central)
12 Plants (travel)

III CONCRETE:
13 Batchers
14 Buggies and Carts
15 Finishers
16 Joints, Expansion and Contraction
17 Mixers (under 1 yd.)
18 Mixers (1 yd. up)
19 Pavers
20 Reinforcing Steel
21 Road Forms (1000' set)
22 Tower
23 Truck Mixers

IV CRANES:
24 Crawler Mounted
25 Truck Mounted
26 Piledrivers

V GRADERS:
27 Blade, self propelled
28 Blade, pull type
29 Blade, under truck
30 Elevating

VI LOADERS AND TRENCHERS:
31 Front-end loader (tractor mounted)
32 Loader, bucket type and belt type
33 Trencher or Ditcher

VII HAULING EQUIPMENT:
34 Dump Truck
35 Other Trucks
36 Dump Wagons, tractor drawn
37 Flatbed Trailers

VIII PUMPS:
38 Centrifugal
39 Diaphragm
40 Piston

IX POWER UNIT: (Independent)
41 Gasoline
42 Diesel
43 Electric

X ROLLERS:
44 Power (Smooth)
45 Pneumatic Tire
46 Sheepsfoot

XI TRACTORS:
47 Crawler
48 Rubber Tired

XII TRACTOR EQUIPMENT:
49 Bulldozers
50 Power Control Units
51 Rippers
52 Scrapers, tractor drawn
53 Scrapers, self-powered

XIII BUCKETS:
54 Clamshell
55 Concrete
56 Dragline
57 Orange Peel

XIV SHOVELS AND DRAGLINE:
58 Crawler (under 1 yd.)
59 Crawler (1 yd. up)
60 Truck Mounted

XV ROCK DRILLS AND AIR TOOLS:
61 Air Compressors
62 Backfill Tampers
63 Clay Diggers
64 Concrete Vibrators
65 Drills, cable tool
66 Drills, tripod and wagon
67 Drills, rock, hand-held
68 Paint Sprayers
69 Paving Breakers
70 Riveters and Chippers

XVI MISCELLANEOUS:
71 Buildings, portable
72 Earth Drills, power
73 Light Plants
74 Lubrication, Service
75 Mowers, Highway
76 Power Saws
77 Soil Stabilizing Equipment
78 Spreaders, sand
79 Street Flushers
80 Street Sweepers
81 Welders
82 Cutting Torches
83 Hydraulic Jacks
84 Hydraulic Control Equipment
85 Hand Tools
86 Hoists, derrick type
87 Highway Guard
88 Snowplows, rotary
89 Snowplows, v or wing

Be sure to fill in name and address below:

Your Name..... Title or profession.....
Name of your company or governmental department.....
Type of work for which equipment will be used.....
Street Address.....
City..... State..... County.....

FOR SALE

New LeTourneau Super C Rockwagon, End Dump, Cummins Diesel Motor Never Used $14,000.00

Huber 3-Wheel Roller, Rear Rolls 24" Wide, Caterpillar D4400 Motor Good as New $4,000.00

982 McKiernan-Terry Steam Hammer with Boiler, 125 lb. Pressure $3,250.00

80 Hp Loco Type Boiler on Wheels

8—60 Hp Waukesha Power Units Clutch and Pulleys on Wheels. Each $450.00

1—40 Hp Hercules Motor Clutch and Pulley $350.00

3—D7 Caterpiller Tractors W/Blades. Each $9,500.00

6" Goulds Cent. Pump 85' Head 1000 GPM. with 30 Hp 3 Ph 60 Cy Motor $650.00

2½ Yd Badger Shovels or Backhoe. Each $5,000.00

1¼ Yd Single Line Clamshell Bucket $450.00

2—60' Boom Wiley Elec. Whirleys on Skids. Each $6,000.00

1—85' Boom 20 Ton Steel Stiffleg Derrick $2,800.00

1—300 BBl B/K Cement Bin Complete $5,500.00

1-3 Comp. 192 Ton Johnson Bin 2 Yd Batcher Car Unloader, Elevator, Motors $6,500.00

1-3 Comp. 100 Ton Heltzel Type P, 1 Yd Batcher and Scales $2,500.00

Flynn Subgrader 8' to 26' Adj. Good as New. $4,250.00

2—Allis-Chalmers Model L Tractors, 90 Hp W/Blades

6—Horsburgh-Scott Speed Reducers 400-1 Red. Each $350.00

WE HAVE OTHER EQUIPMENT—LET US KNOW WHAT YOU WANT TO BUY OR SELL

THE T. J. LANE CO.
Box 665, Springfield 99, Ohio
Dial 3-3362, Eve. 3-3761

FOR SALE

1948 International TD-14, 2 blades, Bucyrus-Erie hydraulic bulldozer and grubber. Fully equipped for dozer tractor. All bought new in August, 1948.

1941 5 ton Federal tractor and heavy duty low-boy. All equipment in A-1 condition.

Price as a unit $12,500.00.

DOWNEY BROS.
Phone 714F3 Monticello, Ill.

FOR SALE

Northwest ¾ yard Model 25 combination dragline and clamshell, 40' boom, 24" wide crawler treads, D-4600 "Caterpillar" Diesel engine.

New Bay City ¾ yard Model 45 combination dragline and clamshell, 40' boom, 24" wide crawler treads, Waukesha gasoline engine.

The Kilcorse Machinery Co.
437-439 Broadway Toledo, Ohio
Phone: MAin 5049

FOR SALE

American model, two-drum hoist.
½ yard Crescent bucket. A-1 condition.
1 CMC 40.M water pump.
3/60/240/440 15 h.p. motor. A-1 condition.
1 Cletrac, Model 55. Engine has been completely overhauled. Machine ready to go to work.
Gar Wood hydraulic dozer. Reasonable.

WILLIAM KAMMEL, La Crosse, Wis.

FOR SALE

Six cu. ft.

"YUBA"

gold placer bucket line pontoon dredge, capable of digging 35 ft. below pond water level.

Dredge is equipped with:

3—Step down transformers from outside power source, 60 cycle, 3 phase, 440 volt power required.
8—Two cell Pan American placer type jigs. Size of each cell 42 in. x 42 in. Complete with accessories.
1—Scavenger jig.
2—Rear steel spuds, 50 ft. long.
110 Ft. Stacker.
Heating boiler and insulated house.

The dredge is in first class operating condition, in the pond near Helena, Montana, where work was completed, and may be inspected.

Will sell complete unit f.o.b. railroad cars, Clancy, Montana.

Additional information will be furnished upon request.

WINSTON BROS. COMPANY
1470 Northwestern Bank Building
Minneapolis 2, Minnesota

FOR SALE

1—Barber Greene (42A) Bucket Loader
1—Little Giant Bucket Loader. Like New.
1—Allis Chalmers Model WM with Hough and loader ¾ yd. bucket.
1—North West model No. 15 dragline with ⅝ yd. Bucket.
2—4x4 Chevrolet Army type Dump Trucks. One with front end Winch.

HOWARD THOMAS

PAXTON, ILLINOIS PHONE 30F21

Boilers and Stokers For Sale

3 H. B. Smith boilers #60S20, 15#WSP., 13,250 EDR.

3 Canton Ram Feed Stokers, #LSU-8, Cont. burning 540-600# coal, 2 hr. peak, 700# Fan-clarage, #4653C. Size 1¼ Motor, 3 HP., 1160 RPM, 208V, 60 cy.

Steam coils, Vento, 5 sections 8' wide, 6' high, 24 fiberglass filters. Will take care of approx. 13,000 sq. ft. of radiation.

Boilers in A-1 condition, used about 1 year.
Stokers in A-1 condition, used about 6 months.
Motors rebuilt.

Equipment F.O.B. Waterloo, N.Y.

For further information call or write to

PINE TRUCKING CO.

P. O. Box 264 at Waterloo, N. Y., Phone 487

FOR SALE

1—25 HP Fairbanks Morse, BB, slip ring motor, 1200 RPM 440 V with starter.

1—20 HP Fairbanks Morse, BB, slip ring motor, 1300 RPM, 440 V with starter.

1—Price deep well or turbine pump, with 7½ HP 220/440 V motor. 6" intake and discharge. Capacity 600 GPM at 40 ft. intake and no discharge head.

E. L. SCHWADERER
Cass City, Michigan

FOR SALE

Construction Equipment

1—Lorain 80—Combination Shovel and Crane, Serial No. 9732. Rebuilt in 1948. Complete with shovel front and 60-foot crane boom, Williams dragline bucket and Fairleads. Kohler light plant.

3—LeTourneau Scrapers—Model FP, 14 to 18 Cu. Yd. Purchased new in 1948. Two of these have never been used.

1—HD-14 Allis Chalmers Tractor. Purchased new in 1946. Complete with trail-builder blade and double drum power control unit. Good condition.

Supply of spare parts for this equipment also available.

Equipment located at Mount Morris Dam Site, Mount Morris, N. Y.

For inspection and details contact

MOUNT MORRIS DAM BUILDERS

Mount Morris, N.Y. *Phone*—Mount Morris 298

SAVE UP TO 30%
ON LIKE-NEW EQUIPMENT

7—Mississippi Wagons

Save more than $4000.00 per unit. Model 75-S, 8½ yd. 72 h.p. tractor, cab, electric brakes. 5—brand new; 2—used three weeks. New equipment guarantee.

2—Terra Cobras

Used only a few weeks. Model TA Tractor; TCY scraper has 18 yd. heaped capacity. New equipment guarantee. Reduced to $17,500 each.

1—Huber 10-T. 3-wh. Roller

Good Operating Cond. Starter, Generator. NOW REDUCED to $2500.00.

Ready for shipment today.
Wire or phone Harry Maloney for complete details.

SERVICE SUPPLY CORPORATION
20th & Erie Philadelphia, Pa.
PHONE: Ba ldwin 9-1950

FOR SALE

One (1) 34E Dual Drum Koehring Paver, completely overhauled—Serial No. 18643.

One (1) Butler Car Scoop for unloading bulk cement, factory rebuilt—Serial No. CH106.

Two (2) C. H. & E. No. 11 Triplex 3" Road Water Pumps.

200 Lin. Ft. Steel Face Forms for 9" Curb.

One (1) 20' to 25' Type H Jaeger Finishing Machine.

One (1) Complete Set of 30' Extensions for Type C Jaeger Finishing Machine including Screeds.

One (1) 20' to 25' Lakewood Pull Subgrader.

One (1) AN D8 Single Power Control Unit.

2500 Lin. Ft. Special 15" x 10" Heavy Duty Heltzel Steel Road Forms.

All of the above equipment located in Milwaukee, price on application.

JOS. D. BONNESS, INC.
1409 N. 27th Street Milwaukee 8, Wis.
Phone West 3-2324

FOR RENT OR SALE

Allis-Chalmers HD-14 tractor with 6 cylinder G.M. diesel engine, in very good condition.

Allis-Chalmers HD-7 tractor with 3 cylinder G.M. diesel engine and Baker hydraulic dozer.

Caterpillar RD-4 tractor equipped with LaPlant-Choate dozer. Less than 1000 hours.

Pacific full revolving 5 ton truck crane, I.H.C. motor mounted on Ford V-8 10 wheel pneumatic tired truck. Excellent.

Baker CFX 5 ton rubber-tired shop crane. Wisconsin gasoline motor direct connected to generator furnishing power to four individual electric motors. Same as brand new.

Allis-Chalmers Speed Ace. 7 yd. bottom dump truck with A.C. pneumatic tired tractor.

500 HP Ford V-8 industrial gas engine. Brand new.

2x6 Allis-Chalmers single deck screen V-belt drive and motor. All brand new.

1½ x 3 Allis-Chalmers single deck screen V-belt drive and motor. All brand new.

Sullivan air compressor, 160 cu. ft. per minute at 125 lbs. 40 HP A.C. 220/440 electric motor mounted on rubber tired trailer. Has done less than one week's work.

Machinery located at Chillicothe, Ill., except compressor which is at Butterfield, Arkansas.

COOGAN GRAVEL COMPANY

903 Jefferson Bldg. Peoria, Illinois

CRUSHERS

GYRATORY: 30" Super. McCully; 36" Allis-Chalmers; also Nos. 12, 10, 9, 8, 7½, 6, 5, & 4.
JAW TYPE: 24x36, 25x40, 22x50, 30x12, 42x48, and smaller sizes down to 7"x9".
REDUCTION TY: 2', 3', 4' & Symons Cone; Nos. 19, 25, 37 & 38 Kennedy; 36" Traylor TZ, 1'5" & 2'4" TY; No. 36 Telsmith Gyrasphere; 7 & 10" Newhouse; Stedman 30 & 36" Imp. Type.
ROLLS: Allis-Chalmers 72x30, 54x24, 54x20, 40x15 & 18x10. Pioneer 18x30. Universal 16x24. New Holland 24x16 & 16x16; McLanahan 30"x60", 18x24 & 18x30 Single Roll. Also others.
HAMMERMILLS: Williams Nos. 2, 3, 4 & 6; Day No. 40 & No. 70; Gruendler 2XB & 3XB; Dixie 2024 & 3650.
MILLS: Hardinge 3'x8", 6'x22", 6'x3', 8'x3' & 8'x4'; Kennedy 4x8, 5x6, 5x11; Marcy 4x5, 6x4 Smidth 16B Tube Mills; Raymond 4 & 5 Roller Mills; Bonnot, Fuller, Sturtevant & others.
CRUSHING PLANTS: 25x40 Cedar Rapids Portable, Diesel Power. Others Portable & stationary.
BINS & BATCHERS: 70 & 150 yd., 3-compt., Etc.
TRUCKS: Euclids, FWD, Internationals, Etc.
SHOVELS: 80-D Northwest 2½ yd. combination Link Belt Speeder K-580, 3 yd., and others.
DRAGLINES: 6 Yd. Walker, 145' boom, Diesel Lorain Model 40-A Crane-Dragline, Diesel.

MISCELLANEOUS ITEMS

Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryer, Derricks, Elevators, Excavators, Generators, Hoists, Kiln, Draglines, Drag Scrapers, Dredges, Drills, Engines, Locomotives, Loaders, Motors, Pipe, Pumps, Rail, Scales, Screens, Slacklines, Shovels, Tanks, Trucks, Tractors, Etc., in many sizes, types and makes at low prices. (I have equipment at many points in the United States and Canada. What you need may be near your plant.)

MARIETTA ALEX T. McLEOD KANSAS

FOR SALE—Universal Crushing plant, consisting of breaker unit, 1536 Crusher, 3 x 8' Apron Feeder, 30" under-crusher conveyor, Allis-Chalmers E-60 gas engine, V-belt drive, mounted on steel wheeled truck, secondary unit, 30 x 18 Roll Crusher, V-belt drive, Allis-Chalmers E-60 Gas engine, mounted on steel wheeled truck, 3' x 6' Simplicity vibrating screen, 24" x 60' Lattice type conveyor, 14' x50' Channel frame conveyor, necessary chutes drives to make plant complete. Priced to sell at $6,500.00. **A. H. PUFFER, 206 S. Main St., Rockford, Ill., Ph. 21921.**

2—Bucyrus Erie 1 cu. yd. Model AX Dragline Buckets	$ 450.00
1—Butler GA-6 Carscoop (Rebuilt)	1650.00
1—Davey 105' Air Compressor Model T1098 on 4 steel wheels	900.00
1—LeRoi 60 ft. Air Compressor Model 60-G-P-E on two pneumatic tired trailers	500.00
1—Farquar 30 inch belt conveyor 80 ft. long powered by VE-4 Wisconsin Engine (new)	1850.00
1—Pioneer 8 x 10 Jaw Crusher complete w/ LeRoi air cooled engine and V belt drive	550.00
1—Carr Form Grader	1200.00
1—Seaman Pulvimixer Model MHD-72 powered by Waukesha Engine	1200.00
1—Rogers Track Pin press portable and complete w/tools & track rack like new	1450.00
1—Littleford Trail - O - Distributor model (new)	1800.00
1—Jaeger Model CS-20 Concrete Spreader adjustable 20 to 25 ft. (Like new)	5000.00
2—Jaeger Form Tampers (new)	490.00
2—Jaeger Model 7DXL Concrete mixers...ea.	350.00
1—Drag Shovel attachment for Bucyrus Erie 22B	1500.00
1—Northwest Model No. 2 Backhoe with 35 ft. crane boom and dragline fairlead	4000.00

The Lorenz Equipment Co.

547 W. Rich St. Columbus 8, Ohio

Phone—L. D. 80

PRICED TO SELL QUICKLY

Machines Have Seen Very Little Use

1—Lorain #82 with 2 yd. Shovel and Dragline
1—P & H 225A Truck Crane
2—Caterpillar #12 Graders
2—Buckeye Crawler ¾ yd. Shovels
1—Buckeye #12 Ditcher
1—Koehring 703 2 yd. Crane
2—D4 Traxcavators
1—Bucyrus Erie 44B
Shovel Front 655A (new) unused in crate. 60% of list
Wanted 1 Shovel Front for Bucyrus 44B

HELLMAN EQUIPMENT CO.

20 Garden Dr. Roselle, N. J.

CONSTRUCTION MACHINERY CORPORATION

General Construction Equipment

P.O. Box 277 Telephone 7-2731

1830 Claiborne Ave., Shreveport, La.

NORTHWEST Shovels, Cranes and Draglines
CHAIN BELT COMPANY, Concrete Mixers, Moto-Mixers, Pumpcrete and Pumps
HELTZEL, Road Forms, Bins and Batchers
GALION, Motor Graders and Rollers
CHICAGO PNEUMATIC Air Compressors and Air Tools
HENDRIX Dragline Buckets
OWEN Clamshell Buckets
C H & E Hoisting Engines and Saw Rigs
TOLEDO Torches
GENERAL Wheelbarrows
PIONEER Gravel Plants and Conveyors
BETHLEHEM Wire Rope
MALL Concrete Vibrators
LITTLEFORD Asphalt Kettles and Distributors
W. E. GRACE Sweepers and Road Brooms, and Tank Car Heaters
GORDON SMITH Ford Engine Air Compressors
KOHLER Light Plants
SASGEN Winches
WISCONSIN Air Cooled Engines

USED EQUIPMENT BARGAINS

Huber 12' Tandem Motor Grader, W/Hercules gasoline engine, closed cab, Hydraulic controls and Scarifier—Excellent mechanical condition. **$3250.00**

Cleaver-Brooks Stationary Type Asphalt Mixing Plant—Practically new—A1 condition. **$3990.00**

Foote 27E Concrete Paver, SN-3779—Fair condition. **$995.00**

THE BODE-FINN COMPANY

2650 Spring Grove. Ave. Cincinnati 14, Ohio Mu. 2200
1518 East First St. Dayton 3, Ohio Ke. 5103

FOR SALE

1—1947 EQSW 64 Mack, tandem drive with Moni-Shift Transmission, 10 speeds forward. Equipped with 4½ yd. REX high discharge mixer. Excellent condition.

2—1940 International DR 50 with 2½ yd. REX mixers. Excellent condition. Operating daily.

1—Barber-Greene Transfer Plant, used to transfer material from batch trucks to mixer trucks.

Bloomsburg Ready-Mix, Inc.

R.D. 2 Bloomsburg, Pa.

Phone: 2145-J

FOR SALE

Subject to Prior Disposition

No. 304 Koehring dragline, Serial C-4875 with 40 ft. boom, Swamp Tracks, GM Diesel motor, 1 yard Hendrix bucket $12,000

"Caterpillar" #66 Pull Grader, Serial 6C—753, 12 ft. blade..... $1,000

"Caterpillar" RD7 tractor and dozer, #9G-5281 ..... $5,000

"Caterpillar" D7 tractor and dozer, Serial 4T-7392..... $9,000

Above equipment on my yard and near Jackson; in good working condition; as is, where is.

If these prices are not high enough, make me an offer.

CLIFFORD WATERHOUSE

P. O. Box 172 Jackson, Miss.

Phone: 2-0617

FOR SALE

2—⅜ Page buckets
1—1½ Yaun bucket
1—⅜ Hanson crane (New)
1—¾ Bay City crane (New)
1—Allis-Chalmers motor grader (Good condition)
1—Austin-Western motor grader (Good condition)
1—Austin-Western screening & crushing plant No. 70
1—T9 Traction swing crane (New)
1—J. D. Power Motor 50 H.P. (New)
1—International Model A motor 20 H.P. (New)

East Lansing Gravel Co.

Route 3 Mason, Michigan

Mason Phone 7221

Lansing Phone 2-5013

FOR SALE

"Caterpillar" D4 tractor w/Trackson Hi-Lift & Hyster winch.
Allis-Chalmers No. 4 Crusher.
Clyde Hoist Double Drums, 22" x 14".
Buda 75 H.P. Power Unit.
All Complete.

MERTEL GRAVEL CO.

2203 16th St. Peru, Illinois

FOR SALE

One Caterpillar Diesel power unit No. 11000. Completely overhauled.
One Sullivan Air Compressor Buda 6 cylinder, with jack hammer.
Dump beds, good condition.
One caterpillar diesel power unit D13000. New.
One Gruendler rock feeder, flat bottom 2x8 ft. New.
Two Gruendler rock crushers 12x20 ft. 20x30 ft.
Two American rock crushers 15x19 ft. 30x40 ft.
One Sullivan jack hammer, one lot drill steel and bits.
One TL20 Lorain ½ yd. power shovel. Practically new.

WM. HARRIS & SON

Tel. Piedmont 149 Piedmont, Mo.

PAVING EQUIPMENT

FINEGRADERS

BUCKEYE #24F adjustable from 20 to 25 ft. cutting width—completely overhauled.

BUCKEYE #13F adjustable from 10 to 13 ft. at 6" intervals—mounted on 36" steel wheels for transporting—completely overhauled.

PAVERS

RANSOME 34E dual-drum—36 ft. boom, late model. This power has done very little work—was put in our shop and all worn parts were replaced — new hydraulic boom swing and bucket dump device installed. Will do work equivalent to new paver at less than ½ price.

KOEHRING 27E—25 ft. boom—completely overhauled in our shop—attractively priced.

CONCRETE SPREADERS

JAEGER Model CS 20 to 25 ft. spreading width—mounted on 4 steel wheels for transporting.

JAEGER Model CS20 to 25 ft. spreading width—mounted on 4 steel wheels—used very little—an almost new machine.

FORM TAMPERS

1—**JAEGER**—Powered by 1-cyl., air-cooled gas engine—adjustable for 8", 9", or 10" height—BRAND NEW—NEVER USED—attractively priced.

5—**JAEGER** Model #1—adjustable for 7" to 10" heights. Powered by 1-cyl., air-cooled, gas engine—travel speed 25 ft. per minute—BRAND NEW—NEVER USED—attractively priced.

FINISHERS

JAEGER—20 to 25 ft. type H tandem screed machine—adjustable—completely rebuilt!

ROLLERS

HUBER—10 ton, 3 wheel—used very little. Excellent Condition.

FERGUSON—"152" Tandem maintenance roller NEW.

BOEHCK EQUIP. CO.
2404-W. CLYBOURN ST.
MILWAUKEE 3, WISC.
DIVISION 2-7810

DEPENDABLE USED MACHINES

Bay City ½ yd. dragline
Osgood "Invader" dragline
Bay City ½ yd. Diesel shovel
Link Belt 2½ yd. crane
Bulldozer on RD7
Carter 4 in. pump

TRACTOR & EQUIPMENT CO.
3521 W. 51st St. Chicago 32

FOR SALE

1¼ cu. yd. American Hoist & Derrick Crane with 40 ft. boom, 1 cu. yd. clamshell bucket. $3,000.00.

Slack Line outfit complete with Thomas Hoist, Cummins Diesel for power; 75 ft. mast, 1 cu. yd. drag bucket and carrier.

American two drum hoist with variable speed

Used 25 HP electric motor. 3 phase. $150.00.

GUARANTEED GRAVEL & SAND COMPANY
MANKATO, MINN.

FOR SALE

10-ton DIESEL TRUCK

Federal, Cummins HB-600, 150 H.P. Ten each 10.00 x 20 14-ply tires. Timken rear end with overdrive transmission. 95% new. 3600 miles. $5,750.00.

IOWA ROCK PLANT, Portable

Two unit. 20" x 36" jaw, double rolls, etc. Only run 6000 tons. Guaranteed like new. Complete with power. Bargain $24,000.00.

270 H.P. GMC Twin No. 671 Diesel Power Unit

Complete with radiators, clutches, etc. Only run 1,400 hours. Guaranteed. $3,000.00.

M. WENZEL
2136 JEFFERSON ST., KANSAS CITY, MO.

DISSOLVING PARTNERSHIP—
MUST SELL

In very good condition:
Unit 514 crane, dragline
Hanson lowboy trailer, 12 ton
Atlas conveyor, 60 ft. with v4 Wis. Diesel Power Unit, 60 horsepower
Int. Dump Truck, 1948, K-7, 5 yd.
Int. Dump Truck, 1947, K-8, 6 yd.
Int. Dump Truck, 1942, K-11, 7 yd.

In fair condition:
Caterpillar tractor, 60 w/end loader
Ford truck, 1937, 500 gal. tank
Work shop on wheels

Many valuable tools.

GALVIN GRAVEL COMPANY
Plano, Illinois
Located at The Ranch on route 34

15—Buckeye Model 70 Shovels or Cranes practically new. $6,000 Each.

15—Quick-Ways with crane booms. P & H Truck Crane very reasonable.

½-yd. Osgood Model 200.

1—Koehring Truck Crane (unused).

H. R. DOUGLAS
Phone West 3-3305
1133 North 25th St.
MILWAUKEE, WISC.

FOR SALE

15B Bucyrus Erie shovel and Backhoe slightly used
Like New—Write:
BOX 1011, ROADS AND STREETS
22 W. MAPLE ST., CHICAGO 10, ILLINOIS

FOR SALE

1—**HD10 AC Diesel tractor with DROTT dozer**, wide gauge, long track, steering boosters, new rails, pinions, bevel and pinion gear, transmission in like new shape, 11½ ft. twin control tilting dozer, 2800 hours.

1—**AW scraper 6 to 8 yd.**, 4 wheel, cable operated, with winch recently rebuilt, scraper in very good condition.

1—**FWD 4x4 tractor** with new Waukesha motor, heavy axles, 9:00x20 tires, and **20 ton lowbed semi-trailer** with 8 8:25x15, 14 ply tires in line, deck about 22 inches above road, 8½ ft. wide with 15 ft. of flat deck, very good shape. To be sold as a unit with the FWD.

EDWIN HUNTOON
TENTH ST., WAUPACA, PHONE 121-W

FOR SALE

1—Double-drum LeTourneau Sheepsfoot Roller. Used less than thirty days.
1—Koehring Longitudinal Finishing Machine or Float, used six days.
1—Ord-Blaw-Knox finishing machine, double screed, set up for 12' road, completely overhauled.
1—TD-18 International Tractor with 12' angle dozer blade, hydraulic pump, recently overhauled in A-1 condition.
4600 linear feet of 8" x 8"—10' Blaw Knox self-aligning road forms (nearly new).
1—Koehring six-bag paver, 30' boom; one-yard bucket; recently overhauled.
1—Barnes road pump.
1—Tournapull rubber-tired machine used six months; 15 cubic yard capacity.
1—LeTourneau 15 yd. pan, tires 18" x 24".
3—Stone spreader boxes, used in macadam roads.
1—Single screed concrete finishing machine suitable for concrete widening adjustable 4 to 6 feet.
1—HD-10 Allis Chalmers Tractor with Baker Hydraulic bulldozer 10' blade. 1948 Model.
1—412 Adams Road Grader, late model, pneumatic tires. Rear 1300 x 24, Front 700 x 24.
1—HD-14 Allis-Chalmers Bulldozer Double Drum Power take-off. 12' hydraulic Baker blade.
1—Jaeger Air Compressor on Pneumatic Tires. 105 cu. ft.

WALLER PAVING COMPANY
Salisbury, Maryland
Phone 1166

---

2 Caterpillar Tractors D-8s

7 Super C Tournapulls
condition fair to excellent—ages 2-4 years

3 Cat DW 10's/CW 10 Scoops
new in 1945. Low hours and good shape
Located on jobs Ohio and Michigan

We'll rent or sell . . . Wire us for more details if you have work for this type equipment.

The Lewis & Frisinger Co.
Ann Arbor, Michigan

FOR SALE

H.D. 10's and 14's Allis-Chalmers Tractors with Hydraulic Dozers. Some have Buckeye and Garwood Cobbe Dozers. Will sell complete or tractor only. These units are now coming out of shop ready for shipment. Priced to sell.

Above Units Can Be Exported

SANTO MESA EQUIPMENT CO.
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½ yd. **OSGOOD "200" Shovel, Pullshovel, Crane or Dragline;** powered by 6-cyl. gas engine.

¾ yd. **BUCKEYE "70" Crane, Dragline, 25 ft. boom, fairlead and sliding tagline.** Powered by BUDA gas engine.

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20 Tons Belgian flint pebbles
1—American pulverizer with 125 HP direct connected motor
1—70 HP Marine type diesel engine, same as new
1—3-Drum Bucyrus steam hoist
All steel dredge boats, scows, tug boats and pug boats
Electric motors DC from 1 HP to 300 HP
Link Belt pan conveyors, 36" x 22' centers
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20' x 100' x 10'
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One industrial property in desirable location, water power, railroad and highways and good labor conditions. Also lake frontage on many desirable lakes.

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1—Sterling Diesel Tandem Tractor with a new H.B. 600 Cummings Motor. Tractor completely rebuilt two months ago by Sterling Motors.
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1—25 Ton 1947 Lilly Low-Boy Trailer with eight 825-15 tires.
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1—1947 Fruehauf 50 Ton Low-Boy Drop Deck Trailer with 16-750x18 tires.
1—Rogers Low-Boy with 80 Ton Drop Deck. 750x18 tires.
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1—10-B-3 and 1—9-B-3 McKiernan Terry steam pile hammers.
1—70 H.P. and 1—50 H.P. 125 lbs. pressure, steam vertical boilers.
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FOR RENT

1—New 20 Ton capacity Bay City Truck Crane, 85 ft. boom.
1—18 ton capacity Manitowoc crawler crane, 90 ft. boom.

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RECONDITIONED 12-inch, 16-inch, 20-inch, 24-inch

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1—Euclid Loader Model BV5, Serial 5BV34. New May, 1947—used on one job, 400,000 c.y. Price—$15,000.
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TD-18 International tractor, used 1700 hours.

Bucyrus-Erie hydraulic dozer with front end pump.

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Would sell scraper and winch separate.

All equipment in excellent condition.

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6 Cylinder Wisconsin Engine, Serial # 1115, Type "E" 6x7.

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1 Bay City shovel, with shovel and Backhoe attachments. Serial No. 2721—½ yd. New in 1941. Ex. cond. Price $7,600.00

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ALL THIS EQUIPMENT IN GOOD OPERATING CONDITION

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Two LeTourneau Model RU Scrapers.
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One Caterpillar D8 Tractor.

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Caterpillar 12, Motor Patrol 9K2846	$5,750.00
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Lima 802, Heavy Duty Shovel & Dragline Combination 70 foot Boom, Long Crawlers, 44 inch Treads, Waukesha Diesel, Lima Precision Air Controls, 2 yard Dipper, Excellent Condition. Price $26,500.00. Immediate Delivery.

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USED—MODEL 315 INGERSOLL-RAND COMPRESSOR, gasoline, 4 steel wheels, WAUKESHA engine.

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One Model 837 single drum dryer with 7 ft.x20 ft. drum, semi-trailer mounting, pneumatic tires, complete with Buda engine, etc.

One 10 ft. Model 879A finisher complete with power hoist, engine, etc.

This equipment can be inspected at the Sheboygan County highway repair shop, has been used only one year, and is good as new.

SHEBOYGAN COUNTY HIGHWAY COMMISSION, Anthony C. Droppers, Sheboygan, Wis., Commissioner.

Pile Driving Equipment

Vulcan and McKiernan-Terry
Steam Pile Hammers and Extractors
Pile Driving Accessories
Drop Pile Hammers and Caps
Steel Sheet Piling

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1¾ yd. Lima 701 crane-shovel-dragline. Superior diesel, overhauled. 60 ft. bm. Bargain.

1½ yd. Lima 601 Crane-shovel-dragline. Caterpillar D-13000 engine. 70 ft. bm. Excellent shape.

25 ton Wiley steel stiffleg derrick. 60 ft. bm., 30 ft. mast. Condition new.

Steel Sheet Piling & Pile Hammers Bought Sold & Rented

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1–Lorain ½ Yard Model TL-20 Dragline with Hendrix Bucket.
1–Lorain ¾ Yard Model L-41 Dragline completely equipped, including Hendrix ¾ Yard Bucket.
1–"Caterpillar" D-6 Tractor, serial No. 4R455 with LeTourneau Dozer & DD Pcu.
1–"Caterpillar" D-6 Tractor, serial No. 5R5120 with "Caterpillar" Dozer & "Caterpillar" DD Pcu.
1–"Caterpillar" D-8 Tractor, serial No. 1H5990, with LeTourneau Scraper & DD Pcu.
1–"Caterpillar" D-8 Tractor, serial No. 8R9579, with "Caterpillar" Dozer & Pcu, also lights and generator.

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STEEL PIPE
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20,000' to 80,000'	Each Size in Stock
¾"	1½"
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Good, Dependable, Used Equipment at prices less than you would expect to pay.

1—Jaeger 2 Cu. Yd., #J9939, Mod. 2HM7L, new Fall of 1948, less than 60 days use, big discount
3—Smith 3 Cu. Yd., mounted on White 4x6 Trucks, Rebuilt, Excellent Condition
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6—Rex 2 Cu. Yd., Rebuilt
3—Jaeger 4 Cu. Yd., mounted on White 4x6 Trucks
2—Smith 3 Cu. Yd.
4—Rex 3 Cu. Yd
2—Jaeger 3 Cu. Yd.
1—2 Cu. Yd. Schmidt Agitator

Complete information, including photographs, mailed upon request.

FUNKHOUSER MACHINERY CO.
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FOR SALE

½ yd. Byers Model 62 Shovel, also has 30 ft. boom with 10 ft. extension and ½ yd. dragline bucket. Best offer takes.
3 yd. Hi-Discharge Jaeger Mixer mounted on 1942 G.M.C. Truck.
1–3 x 10 Roller Bearing, 2 deck Simplex Screen.
1–1946 Ford Truck, 2 ton. Long wheel base.
1–1934 Model BS 5 ton Mack Truck. Long wheel base.
1–set 8" Turbine Deep Well Boals.

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Model "LO" Allis-Chalmers tractor with Drott angledozer; used 300 hrs. since guaranteed as new. $6,750.
1939 3-ton GMC tractor and 20 ton low bed trailer. $2,100.

DONALD BORGEN, Amherst, Wisconsin

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"CRAWLER TRACTORS FOR SALE"

Used, reconditioned machines, gas or Diesel, any size, reasonable.

RICE PETROLEUM CO.
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Michigan Truckcrane ½ yd. Model TM DT-16 10-ton capacity, 35′ boom, outriggers.
Michigan Crawler Crane, ½ yd., C-16 with or without Hoe attachment.
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Worthington 210 cu. ft. portable air compressor with 6 cyl. Continental gasoline engine & starter.

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For use on International T-9 Trac-Tractor:
1 Hydraulic or cable control unit, A-frame, arms, and either straight or angle-dozer blade. Must be complete and in operating condition.
For use on International TD-18 Trac-Tractor:
1 Hydraulic Unit consisting of: Front end pump, valve, tank, and operating levers to accommodate 6 hydraulic hose for operating scraper pan. Must be complete and in operating condition.
Advise by letter, location, condition and price.

AQUILA CONSTRUCTION COMPANY
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ONE—used 6 cylinder, 225 H.P. Buda Diesel Generating plant. 440 Volt, 3 Phaze, 60 cycle, 150 KVA
ONE—6 cylinder 250 H. P. Buda Diesel Generating plant, 440 Volt, 3 Phaze, 60 cycle, 200 KVA. This has been used.
TWO—G.M. 6 cycle Diesel Twins, 350 H.P. single output shaft, motors twin clutches. These are new units.
ONE—G.M.C. 6 cyl. Diesel engine, 175 H.P. with flywheel. This is a new unit.

These units can be seen at our plant at Hartland, Wisconsin.

HARTLAND SAND & GRAVEL CO.
PHONE 511 HARTLAND, WISCONSIN

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1—Complete Portable Gravel Washing & Crushing Plant. D-13000 Diesel Elec. driven
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550 Pc.	3"	x 3" x 5/16"	x 40′	Angles
710 Pc.	3"	x 3" x ⅜"	x 40′	Angles
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70 Tons	1½"	x 1½" x ¼"	x 20′	Angles
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6—Super "C" Tournapulls, C3T-2858CIF; C3T2854CIF; C3T-2860CIF; C3T2850CIF; C3T-2841CIF; C3T2859CIF; all in good working condition $25,000.00

1—Lorain "40" Crane, 2699, new motor and radiator.....$3,000.00

1—LeTourneau H-3 Rooter in good condition $300.00

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8—Four ft. Drums Sheepsfoot Rollers (LePlant Choate)..... .....$200.00 each

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1—Armco repair shop building 76 x 24 x 14 with four large doors, in very good condition. Was erected, new, on present foundation in 1948.....$2,000.00

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COMPRESSORS: I-R K-500 diesel, 1942
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C-P 105, mod. P.G.20, 1942, rubber tires
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Littleford 2 ton, model 155, like new
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RD6 Caterpillar, hrdl. angle blades, rebuilt
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C-M-C 10" centrif. 6 cyl. Waukesha, unused
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Caterpillar D-2 Tractor, w/Hyd. LaPlant Angledozer, $2,200.00
Caterpillar D-4, w/Angledozer. Late Model, $4,000.00.
Caterpillar D-8, Late 2U series. w/Cat. A/Blade, $12,500.00

SHOVELS

Bay City, New Model 45, Diesel Shovel, 318 Engine, $17,500.00
Osgood Model 200 Crane. Late Model, $6,500.00
Northwest ¾ yd. Shovel. Model 3, New GMC 4 cyl. Diesel Engine, $4,200.00
Lorain 820 Shovel, Clean, Late machine, $25,000.00

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Parsons Model 25 and 310.
Cleveland Model 95, 110, 140 Wheel type.
P & H Model 10-30, 12 ft. deep. $1,900.00
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1—Marion Model 342 1 yd. shovel with 60 ft. dragline boom and fairleads, crawler mounted, Caterpillar Diesel D-11000 Engine, 2½ yrs. old, used very little, is like new.

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One 24" x 36" Austin Western jaw crusher—UD18 International diesel engine—V belt drive—Apron feeder—Hopper—36" conveyor under trucks—30" discharge conveyor—all mounted on dual tandem 10:00 x 20 rubber tires with vacuum brakes.

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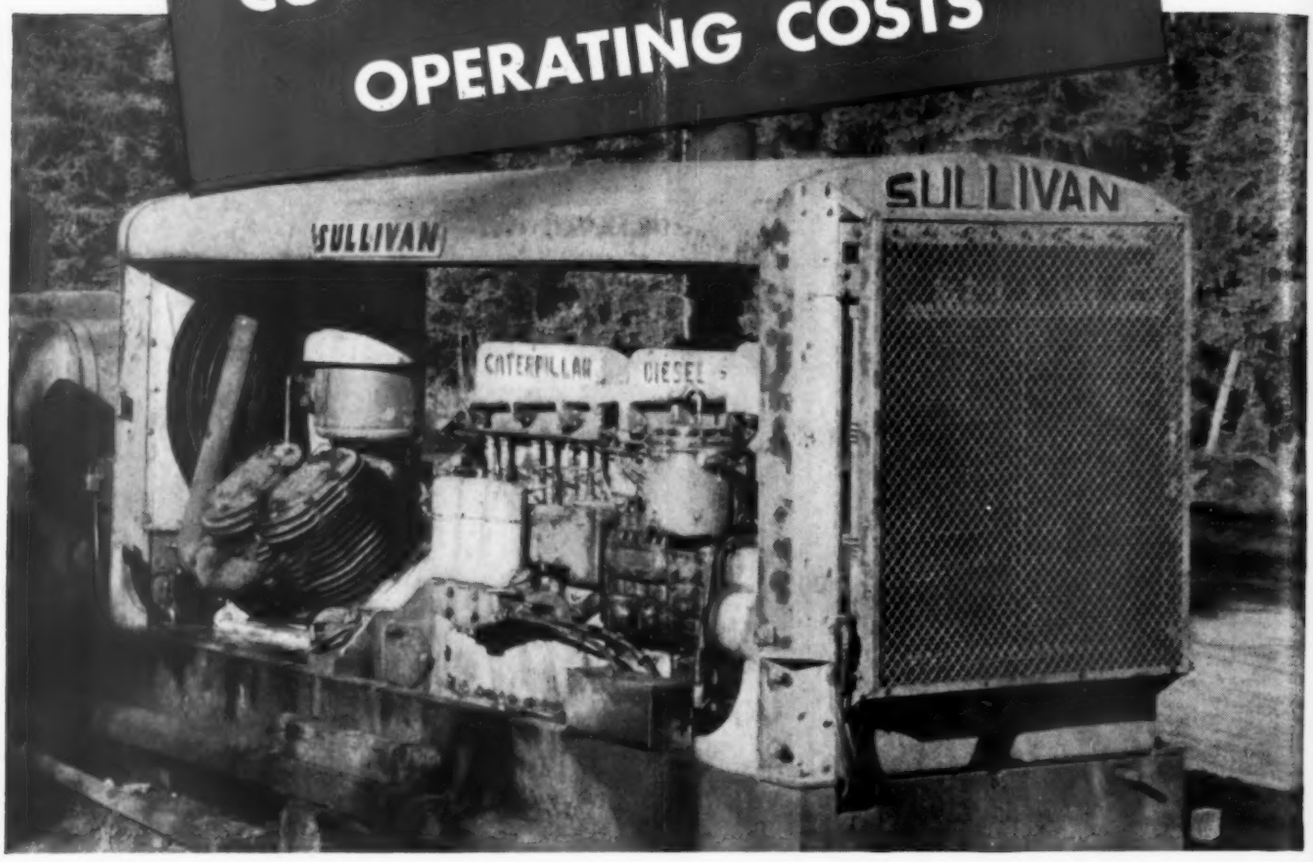

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